RAILROAD GAZETTE

FRIDAY, OCT. 10.

CONTENTS.

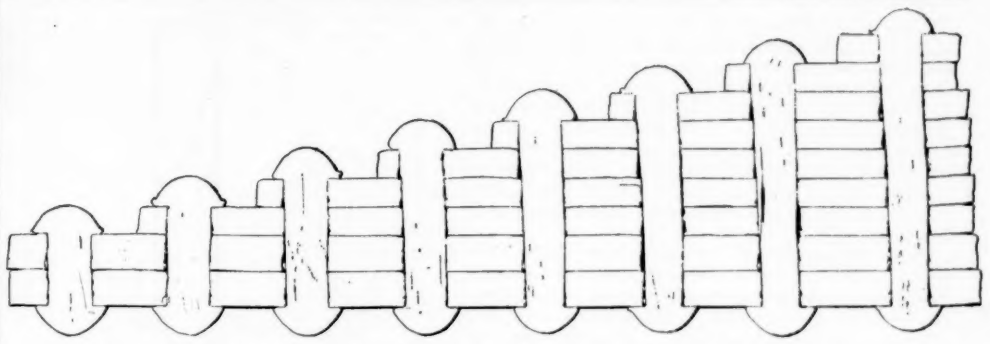
Tests of Riveted Plates.

In the engravings are shown four specimens of riveting done under different conditions in order to ascertain the thickness to which plates can be piled and still have the holes completely filled by rivets. These experiments were made for Mr. C. W. Buchholz, Civil Engineer, New York, Lake Erie & Western Railroad, by the Union Bridge Company, at Athens, Pa. They were designed by Mr. H. B. Seaman and carried out under the immediate direction of Mr. J. H. Watson, the inspector. The occasion for making the tests was as follows: With the increase of engine weights heavier standards have been adopted for the loads in building the more recent bridges on the Erie. It was found that the thickness of the flanges of the plate girders was so much increased as to make it necessary either to materially increase the width of plate or to adopt another form of flange section. Neither of these changes was desirable if it could be avoided. The first one necessitated an extra row of rivets on each side, diminishing the section of the flange to resist tension. The other expedient required more templet work and prevented stiffening the flange by running the stiffeners over the flange angles. In order, therefore, to ascertain the thickness to which plates could be piled and still properly riveted these experiments were made.

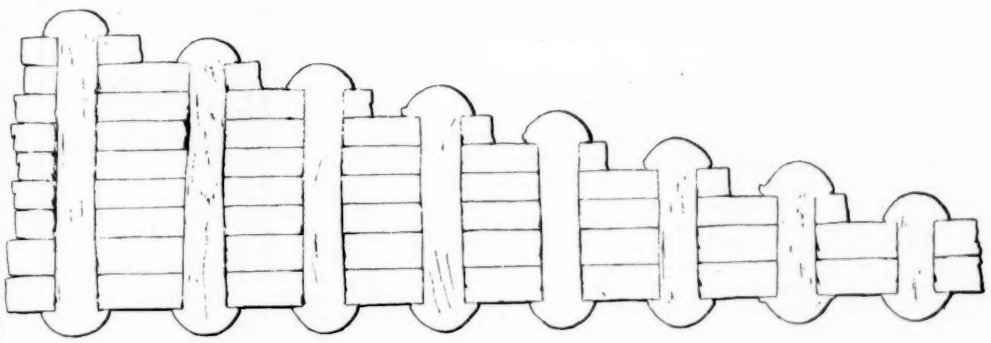
Two specimens were made each of nine plates. The two longest plates in each specimen were 20½ in. and the shortest plate was 3 in. All were 5 in. wide. The two long plates in each specimen were ¾ in. thick; all the rest were ⅝. The height of the pile, therefore, was 5⅞ in., the length 20½ in., and the width 5 in. Two lines of rivet holes were punched lengthwise of the plates and 3 in. apart, and the rivets were spaced 1¼ in. centre to centre, except the two longest pairs, which were ½ in. centre to centre. In each specimen one line of rivet holes was punched ⅞ in. in diameter and reamed to $\frac{15}{16}$. The other line of holes was punched $\frac{15}{16}$, and not reamed. All rivets were ⅞ in. diameter. In one specimen the rivets were driven by machine and in the other by hand.

The results are shown in the four engravings. The specimens were cut through the centre line of rivets, and the drawings from which the engravings are made were traced directly from the face of the metal. The engravings show quite accurately the appearance of the sections on the surface, but they cannot show the *depth* of the openings between the rivets and the plates.

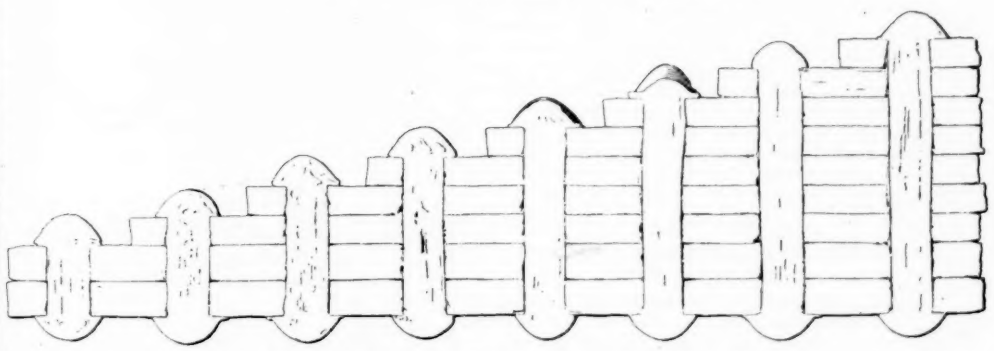
The conclusions arrived at are that the limit of thickness which can be riveted and have the rivets properly fill the holes is about five times the diameter of the rivet; that holes for hand-driven rivets should be reamed smooth when more than two plates are used. The proper thickness, however, would probably not be increased in direct proportion to the diameter of the rivet, owing to the greater power necessary to upset the rivet as its diameter increases. These specimens will be found of unusual interest to engineers and bridge builders, in view of the increasing use of long plate girders and the constantly increasing weights of rolling stock.



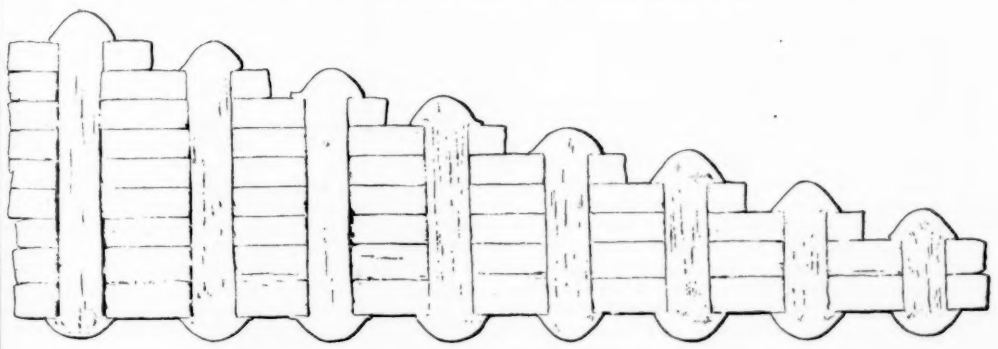
Hand Driven, Punched 15-16 in., not Reamed, Rivets 7-8 in.



Hand Driven, Punched 7-8 in., Reamed 15-16 in., Rivets 7-8 in.



Machine Driven, Punched 15-16 in., not Reamed, Rivets 7-8 in.



Machine Driven, Punched 7-8 in., Reamed 15-16 in., Rivets 7-8 in.

TEST SPECIMENS OF RIVETED PLATES.

The Superintendents' Association.

The nineteenth meeting of the American Society of Railroad Superintendents was held at the Hotel Brunswick, New York City, on Tuesday of this week, morning and afternoon sessions of about 2½ hours each being held. The President of the Association, Major C. S Gadsden, of the Charleston & Savannah, was in the chair. There are now 116 active members in the Association, of whom 30 were present. The following new members were elected:

A. Clark (N. O. & N. E.), B. F. Dickson (L. & N.), J. L. Greatsinger (D. & I. R.), M. Hopkins (C. & N. W.), James Montgomery (Ohio Valley), J. J. Oliver (C. & N. W.), J. G. Osborne (N. & W.), A. T. Palmer (Union Pac.), J. H. Redmon (Iowa Central), F. Eldridge (L., N. O. & Tex.), J. N. Seale (M. & O.), E. F. Knibloe (N. Y., L. E. & W.), J. C. Cassell (N. & W.), C. S. Clarke (M. & O.), C. R. Fitch (N. Y., L. E. & W.), D. B. McCoy (West Shore), A. J. McEvoy (Middle Ga. & Atlantic), W. L. Derr (N. Y., L. E. & W.), W. T. Perkins (Boston & Maine), L. A. Boyd (I. D. & W.), F. Ellmaker (Peansylvania), James Reed (Pennsylvania), E. D. Whitcomb (Philadelphia & Reading), J. H. Parsons (N. Y., L. E. & W.), W. D. White (Penobscot Shore Line), A. W. Johnson (N. Y. C. & St. L.), R. J. Duncan (Union Pacific), A. Grant (Orange Belt), O. E. McClellan (Pennsylvania), W. E. Costello (A., T. & S. F.), E. L. Du Barry (N. & W.), D. W. Rider (Jack. S. E. Line), W. W. Bond (V., S. & P.), P. S. Blodgett (L. S. & M. S.) A. A. Aveilhe (S. F. & W.), H. B. Briggs (Duluth, Red Wing & S.), E. A. Peck (C., C., C. & St. L.)

Prof. C. H. Koyl and James Churchward, C. E., were proposed for associate membership. These two names went over, under the constitution, until the next meeting. The Committee on By-Laws made a report recommending a number of changes, which were adopted. The Executive Committee made a report recommending that the salary of the Secretary be made $200 a year, and that advertisements be accepted for publication in the Proceedings of the Association sufficient to defray the expenses of publication. It was also recommended that a letter ballot be taken on the question of having a dinner in connection with the annual meeting of the Association. The Executive Committee finds that many roads not only pay the expenses of their officers to this Association, together with the membership fees, but insist on their men attending the meetings, and it is recommended that a circular be issued to all railroads asking their views on the question of thus aiding the Association. All these propositions of the Executive Committee were approved.

The Secretary read his annual report. The publications of the Association have been sent to the Commissioners of the various states and to a number of prominent libraries and other institutions. Suitable resolutions were passed in memory of the four members of the Association who have died during the year—Messrs. H. M. Britton, J. M. Metheany, W. H. Turner and W. E. Lewis.

The Treasurer reported receipts of $228 (balance on hand), $636 for dues, $73 for back dues and $755 for advertisements, etc.; total receipts, $1,692. The expenses of the association were $1,209; balance on hand, $483.

Officers were elected for the ensuing year as follows: President, H. Stanley Goodwin, Lehigh Valley; First Vice-President, R. G. Fleming, Savannah, Florida & Western; Second Vice-President, C. W. Bradley, West Shore; Secretary, C. A. Hammond, Boston; Treasurer, R. M. Sully, Petersburg, Va.; members of Executive Committee for two years: C. S. Gadsden, Charleston & Savannah; O. E. McClellan, Pennsylvania; for one year: O. M. Shepard, New York, New Haven & Hartford; A. B. Atwater, Chicago & Grand Trunk.

The Committee on Machinery made an informal report on car heating and introduced Mr. Carrington, of the

Morton Safety Heating Co., Baltimore, Md., who explained the passenger car heating system of his company. It consists, briefly, of a plan for using a tube or cylinder of earthenware, inclosed within an iron tube, by which it is claimed that by turning on steam for 15 minutes a sufficient amount of heat can be stored to heat a car for two to three hours. This system is to be tried the coming winter on the Intercolonial, Grand Trunk, Canadian Pacific, Chicago, St. Paul, Minneapolis & Omaha, Norfolk & Western and Richmond, Fredericksburg & Potomac.

Papers were read by Mr. W. G. Wattson, of the West Shore, on The Systematic Handling and Distribution of Freight Cars, and by Secretary Hammond on Signaling. Mr. Wattson's paper will be found in another column. After Mr. Hammond's paper, the meeting, on motion of Major F. K. Huger, directed the President to appoint a committee on signaling, to consist of five active and two associate members. President Gadsden appointed on this committee F. K. Huger, J. J. Turner, J. Donnelly, C. H. Platt, and C. D. Hammond.

At the afternoon session Mr. H. H. Westinghouse, of the Westinghouse Air Brake Co., read a paper on Recent Improvements in the Air Brake, which will be found in another column. At the close of his address Mr. Westinghouse answered a number of questions concerning the best practice. On motion of Mr. C. W. Bradley the meeting passed a vote of thanks to the speaker. Mr. James Churchward, C. E., read a paper on Rail Fastenings and Rails, for which the meeting, on motion of Captain R. G. Fleming, passed a vote of thanks. The remainder of the session was taken up by an informal discussion on train rules, various paragraphs of the Standard Code being taken for texts.

Mr. H. F. Royce proposed several changes in the constitution, which go over until the next meeting under the rules. On motion of Mr. C. W. Bradley the convention, by a rising vote, thanked the retiring President for his efficient services, it being the universal sentiment that the success of the Association has been very largely due to Major Gadsden's energetic work. An invitation was received and accepted requesting the members to visit at their convenience the rooms of the New York Railroad Club in the Gilsey House, Broadway and Twenty-ninth street. The club was to meet there on Thursday of this week to discuss its work for the coming winter.

Automatic Smoke Preventer for Locomotives and for Stationary Boilers.

This device has been in use on a locomotive on the Chicago, Milwaukee & St. Paul for over a year, and it is now being introduced in Chicago. The construction and operation are as follows: A small cylinder *A*, 4 in. in diameter, is fitted with a piston *B*, having a leather packing, as shown, and carrying on its upper surface a cast iron weight *C*. The cylinder is filled with oil above and below the piston, which is displaced as the piston moves, the oil flowing from the top to the bottom, or from the bottom to the top, as the case may be, through the small bent pipe *D*, fitted with a controlling valve *E*. It is filled with oil by means of the cup at *F*, the opening being closed by the stop-cock *G*. To the top of the piston is connected a piston rod *H*, which extends through a stuffing box at *J* to a second cylinder having a piston with leather packing at *K*. On the end of the piston rod is a jaw *L* for a rod connection to a steam valve which admits live steam to the furnace through an injector whenever desired. The injector is shown in fig. 2. It consists of an inner tube *M*, connected by a ¾-in. steam pipe at *N* to the steam valve, which is controlled by the connection leading to the end of the piston rod at *L*, fig. 1. The end of the inner tube has an opening at *O*, $\frac{3}{32}$ of an inch in diameter, and steam issues from it directly into a 2-in. steam pipe screwed into the injector at *P*. Air is admitted at *Q*, and by means of the steam jet air is drawn into the injector and forced into the fire box. The outer tube *R* is connected to a cavity *S*, which is in turn connected by 1½-in. pipe to the exhaust pipe of the locomotive, or engine of any sort, connected to the boilers.

On the left of fig. 1 are shown two automatic devices for controlling the live steam jet. The exhaust steam jet is allowed to run at all times. This automatic device consists of a spindle valve, as clearly shown, an extension of the stem of which points downward, as shown at *T*, and another one leads out of the side from the opening *U*. The spindle *T* is operated automatically by the fire door whenever it is opened, while the spindle *U* is operated whenever the throttle valve is closed. The operation of this device is as follows: Whenever the fire door is opened or the throttle closed, steam, or air from the air drum, is admitted through the spindle valves by a pipe screwed in at *V*, fig. 1, to the under side of the upper piston. This lifts both pistons and opens the live steam valve connected to *L*. This remains open until the weight *C* on the lower piston has forced it down by displacing the oil through the controlling valve *E* and the pipe *D* to the space above the piston. By opening and closing the valve *E* the time of the operation of the live steam jet is regulated.

With this device, while air and exhaust steam are continually being blown into the fire box, there is an additional amount of air and steam driven in when the fire door is opened for shoveling in coal or the throttle

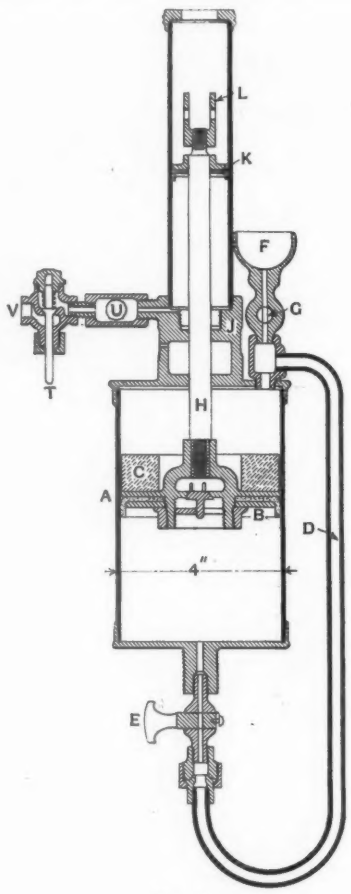


Fig. 1.

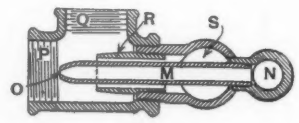


Fig. 2.

The Walker Automatic Smoke Preventer.

is closed, these being the occasions when a locomotive is most liable to smoke. The device is known as the Walker automatic smoke preventer, and the business office is at Brewster's Exchange, Grand Pacific Hotel, Chicago.

The Iron and Steel Institute and the German Iron Workers.

Last week we gave a report of the first session of the British Iron and Steel Institute which was held in New York on Wednesday. Thursday morning the second session was held. Mr. R. N. Daelen, of Düsseldorf, continued the discussion of Mr. Gayley's paper on the large yields of American blast furnaces, saying that any such output as Mr. Gayley had reported would be impossible in German works. The discussion was continued by Mr. E. Windsor Richards, who doubted the policy of rapid driving. Mr. E. C. Potter, of the Illinois Steel Co., thought that he could show even greater results than Mr. Gayley had cited. Mr. G. J. Snelus, of the Institute, spoke of the great and economical yields described by Mr. Gayley, and said that "if we can find out the causes of this result our journey of nearly ten thousand miles will not have been in vain." He did not object to rapid driving; the economy shown by American furnaces will more than counterbalance the deterioration of the plant. This important paper was further discussed by the members of the Iron and Steel Institute as well as by Americans.

At the close of this discussion Sir James Kitson formally presented to Mr. Abram S. Hewitt the Bessemer gold medal and diploma awarded for distinguished services to the iron and steel trades. Sir James Kitson said that, after much consideration by the Council, the medal had been awarded to Mr. Hewitt for the reason that he had been so long and well known as a bold investigator and enterprising manufacturer. It was due to Mr. Hewitt to say that he had declined to accept the medal, considering that there were others in America who had much better claim to it, but his objections had been overruled by his friends. Mr. Hewitt's report on the iron and steel exhibits at the Paris Exposition of 1867 had done much to awaken Englishmen to the necessity of scientific progress in this line, and laid the foundation of the Institute. Sir James related at length Mr. Hewitt's further claims to the medal.

Mr. Hewitt replied in an address, pointing out the wonderful changes in industrial and social conditions brought about by Sir Henry Bessemer's discoveries and inventions. He said the invention of printing, the discovery of the magnetic compass, the discovery of America, and the introduction of the steam engine are the only capital events in modern history which belong to the same category as the Bessemer process. He then pointed out how the introduction of cheap steel had benefited the great mass of the people of all lands and was sure to undermine the aristocracies.

Mr. Hewitt's address was followed by a paper by Mr. Henry M. Howe, of Boston, entitled Notes on the Bessemer Process.

On Thursday afternoon Mr. James Dredge read an address on Alexander L. Holley, which was followed by the unveiling of a bust of Holley in Washington Square. Mr. J. C. Bayles made a speech presenting the bust to the city, which was accepted by Mr. Gallup, President of the Park Board. Thursday evening the Institute held its annual banquet at Delmonico's, and the Society of German Iron Workers attended a reception given to them by the Liederkranz.

On Friday the first paper was on Aluminum Steel, by Mr. R. A. Hadfield, which was followed by Prof. Elihu Thomson on Electric Welding.

Dr. C. B. Dudley read the closing paper of the session on Wear of Metal as Influenced by its Chemical and Physical Properties. This paper is given nearly in full in this issue of the *Railroad Gazette*. It was but very briefly discussed. Sir Lowthian Bell recognized the impossibility of predicting the wear of steel rails from their chemical composition. For years all broken rails on the Northeastern Railway have been analyzed, but no law has been established. Several years ago, however, the carbon was raised from 0.4 to 0.5 per cent., and the results were so far satisfactory.

In the afternoon the excursion which was most attended was that to Edison's works at Llewellyn Park. More than 400 people went by special train to Mr. Edison's home, where a luncheon was served, the laboratories and workshops visited, and drives were taken through the park.

Another excursion was taken to the Tilly Foster ore mine, and another was up the East River.

On Saturday the party went to Philadelphia, stopping on the way at the works of Henry Disston & Sons, from which place a steamer was taken down the Delaware River to Chester, and finally to Philadelphia.

Monday morning a large number of the visitors went to Phenixville to visit the works of the Phenix Iron Co. and the Phenixville Bridge Works. Here the works were inspected and the party had luncheon. Various other excursions were arranged for Monday to the Baldwin Locomotive Works, the Sellers Tool Works, the Whitney Car Wheel Works and the works of Bement, Miles & Co. A reception was given in the Academy of Fine Arts in the evening.

On Tuesday the party visited the coal and iron mines at Cornwall, Pa., and the furnaces at Lebanon, and Tuesday evening went to Harrisburg. On Wednesday the party went to Altoona and Johnstown. Thursday the first session was held at Pittsburgh.

The Wear of Metal, as Influenced by its Chemical and Physical Properties.*

BY C. B. DUDLEY, PH. D., CHEMIST OF THE PENNSYLVANIA RAILROAD.

In October, 1878, and again in February, 1881, I had the honor to make public, through the medium of the American Institute of Mining Engineers, the results of an extended study of steel rails which had been in service, and which were taken for the purpose from the tracks of the Pennsylvania Railroad Co. These studies appeared in three papers. In the first of these papers the question of what kind of steel is least liable to fracture or disintegration in the track was the principal one considered. In the second paper the question discussed was, Does the power of steel to resist wear increase with the hardness? In the third paper the relation between wear and the chemical and physical properties of the metal was the principal point considered. The conclusions reached were as follows: 1, that a mild steel is less liable to fracture, and, if properly made, less liable to crushing or disintegration in the track than a harder steel; 2, that the wearing power of steel in rails not only does not increase as hardness increases, but, on the contrary, diminishes; or, in other words, that a mild steel gives less loss of metal under the same service than a hard steel. These conclusions may be briefly stated in a single sentence—namely, in rails mild steel is not only less liable to fracture and disintegration in the track, but it also gives longer life, or wears more slowly under the same traffic, than harder steel. It is perhaps hardly necessary to add that by mild steel is meant steel with smaller percentages of carbon, phosphorus, silicon and manganese that is characteristic of harder steel.

My own criticism of this work, after the lapse of ten years, and after all the discussion which followed the publication of the papers above mentioned, may, perhaps, be fairly summed up in four conclusions:

1. If I had the work to do again I would certainly determine the sulphur in the rails, since all our studies during the past ten years on the influence of sulphur point strongly in the direction of indicating that the sulphur has an important influence on steel, especially in its effect on the carbon.

2. The influence of silicon, and especially its influence from the metallurgical standpoint, seems to be much better understood now than at the time when these studies were begun, and if an ideal formula, representing our views as to the best possible composition for steel rails, was to be made at the present time, the silicon limit would be raised somewhat, possibly to the favorite figure of Mr. Sandberg—namely, 0.10 per cent.

3. It is possible that in the first paper published the influence of the chemical composition on crushing or disintegration of rails in the track was made more prominent than the facts would warrant. More mature studies would seem to indicate that disintegration or crushing of steel is largely a resultant of lack of sound-

*Extracts from a paper read at the New York meeting of the British Iron and Steel Institute, Oct. 3, 1890.

ness in the ingot, and is more mechanical than chemical, except in so far as chemistry may be responsible for the soundness of the ingot. However, upon this point of sound ingots, we have seen little reason to modify the views held for some time, that time is more important in securing sound ingots, especially time in certain critical parts of the process, than any other single element. If our views are correct, sound ingots, with consequently sound rails, can be made from steel of varying composition, provided time is allowed at the right points in the process, and the claim that high manganese and high carbon are essential to secure sound ingots is, in our judgment, not well founded, provided that time enough is allowed to make the steel properly.

4. In all our later studies on the wear of metal we have, as far as possible, avoided a method of deciding which metal is best which attempts to give what may be called absolute results. In other words, loss of metal by wear, per million tons, has some necessary errors in it, and, accordingly, in our late studies we have adopted the method of comparison: Two metals of different composition are subjected as nearly as possible to the same wear, and the one which wears the faster, by comparison with the other, is regarded as the poorer, as will be explained a litle later. . . .

One point further in regard to the work already done on this subject. Samples of all the rails which were discussed in the third paper, above mentioned, have been carefully preserved with the idea in mind of some time repeating the work, with the improved means and methods which time and study in the realm of chemical metallurgy should place in our hand. Especially has it been hoped that some methods of chemical analysis would be devised which would enable us to determine not only the total amount of carbon, phosphorus, silicon, manganese, sulphur, etc., in these various steels, but also how these substances were combined. For example, does the phosphorus in any given rail exist as phosphide, or partly as phosphate, or both? Is the silicon simply alloyed, or chemically combined with the iron? Does the carbon all appear as strength carbon, or is some of it graphitic, or combined with the iron in such a way as to form a crystalline body which adds nothing to the strength? The 10 past years have done something in unraveling these mysteries, but hardly enough, we think, has been developed as yet to enable us wisely to re-examine these rails. It has been our belief for some time that no decided step forward in the chemical metallurgy of steel could be taken until we have solved some of the questions as to how the various impurities which occur in steel exist in the metal. . . .

Otherwise than as regards the criticisms above mentioned—namely, that the sulphur should have been determined, possibly the silicon limit raised a little, the influence of the method of manufacture on the final product made a little more prominent, and the comparative method used as far as possible in determining the difference between good and poor rails—we have seen little occasion to modify the conclusions stated in the papers as published; that is to say, during ten years past, with our minds constantly directed to the question of what kind of steel will give the greatest safety and the least wear, not only in rails but also in almost all constructive uses, we have seen no occasion to change the main conclusion previously reached—namely, that mild steel is not only safer for rails and other constructive purposes, but also that mild steel gives better wear or loses less metal under the same traffic than harder steel. It seems quite probable that this conclusion will hardly be accepted by the mass of engineers, or by those who are engaged in metallurgical industry, and the object of this paper is simply to bring up to date the additional information which has been accumulated on this subject during the past ten years. Meanwhile, what light have the past ten years thrown on the special subject of the relation between wear and the chemical and physical properties of metal?

1. Since the papers above referred to were published no systematic study of steel rails has been attempted in the Pennsylvania Railroad Laboratory.

2. It will be remembered by those who are familiar with the discussion which followed the publication of the papers on steel rails that some trial rails, according to the formula suggested in the first paper, were made in Germany, and inspected by Mr. Sandberg, who made his work the subject of a contribution to the discussion. The place where these rails went into service never came to my knowledge until a little over a year ago. At that time I received a letter from Mr. P. H. Conradson, the chemist of the New York & New England Railroad, stating that he had found in the records of that road that 2,500 tons of steel rails, in accordance with the formula suggested in the first steel rail paper above referred to, had been made at Gütehoffnungshütte, Germany, and had been laid on their road. . . . In general, the rails came within the limits of the specification—namely, in no case was carbon above 0.35 or below 0.25 per cent.; manganese was in no case above 0.40 or below 0.30 per cent.; phosphorus was between 0.055 and 0.075 per cent., and silicon varied from 0.01 to 0.08 per cent.; most of them being about 0.05 per cent. The physical tests were also fairly close to the assigned limits of the specifications—namely, they were generally within 75,000 lbs. tensile strength per square inch, with not less than 20 per cent. elongation, the limits being from 73,000 to about 80,000 lbs. tensile strength per square inch, and 17 to 23 per cent. elongation. The rails weighed 60 lbs. per yard, and were put in the track where they could be subjected to the severest service. They remained at this point seven years, and were taken up to be replaced with a heavier rail. . . . We are without positive data, expressed in figures, as to how these rails wore. The statements, however, of those most familiar with the rails while they were performing their service were to the effect that they were in every sense satisfactory, and that they gave excellent results. The words of the one most competent to judge, quoted by Mr. Conradson, are as follows: "These rails have not changed any during these seven years of continous use so that it can be detected by the naked eye." . . . There is certainly nothing in the data to controvert the idea that mild steel gives better wear in rails than hard steel.

3. I am aware of the conclusions reached by M. Verschovsky, Engineer-in-Chief of the Russian State Railroads which were stated in a paper read before the Railroad Congress in Paris in 1889. I have not seen the original paper, but simply a translation. The conclusions reached by M. Verschovsky seem to be directly opposite to the conclusions which we have reached—namely, "the best wearing rails have the greatest tensile strength with the least elongation;" and again, that the "rails which broke were softer, as far as indicated by tensile strength and elongation, and there is a difference between a hard rail and a brittle one." Still, further, as regards the chemical composition, "the best rails contain more carbon and manganese than the brittle ones, and in all cases much more silicon and less phosphorus." In the absence of data as to what constituted the best rails—that is, as to how the best rails were decided on—and in the absence of any positive data of loss of metal by wear, it is, of course, exceedingly difficult to criticise or explain the conclusions obtained by M. Verschovsky. However, one point in the paper seems to throw some light on the possibilities of the case. It is stated that, in consequence of the specifications issued by the government, the steel works did all in their power to produce a soft steel, so as to insure that the "frozen rails should stand the falling or drop test prescribed," and that this result was accomplished, but that, as a concomitant of this soft steel, a new difficulty appeared, which was that after a few months of wear the rails began to crush or flatten at the ends, so that in a short time replacement was found necessary. To our minds this seems to indicate that as the result of the effort of the steel works to produce soft steel very unsound or porous ingots were obtained, which produced rails that were not sound and homogeneous, and which would be likely to behave exactly as M. Verscovsky describes. It will be remembered that this difficulty of getting sound ingots with soft steel was largely the burden of the discussion which followed the publication of the steel rail papers, and it seems fairly probable that the difficulty which M. Verschovsky describes may be entirely due to this cause. If the steel works, in trying to make the soft steel, so hurried the process that unsound and porous ingots were obtained, we see no difficulty in accounting for the conclusions which M. Verschovsky has reached. We ourselves have seen and analyzed steel which was not only brittle, but which also readily disintegrated under blows, and gave both low tensile strength and low elongation, while on analysis it was almost ideal in its proportions of carbon, manganese, phosphorus and silicon to make good rails. The difficulty with the steel was that it was improperly made. The sample which we have in mind was a special blow, made for a special purpose; its history was known completely, and we are confident that few practical metallurgists will disagree with the conclusion that if, at the end of the blow, sufficient time is not allowed to elapse to secure deoxidation, and if the metal is cast while it is still rapidly boiling, a steel will be produced which will not only be brittle, but also of low tensile strength, low elongation, and in every sense unreliable. We are free to confess that we would much prefer a hard, sound steel to a soft, unsound one. Our plea has always been for a sound, homogeneous, mild steel. Of course it is impossible for us to say that the above was exactly the case with the rails tested by M. Verschovsky, but the facts seem to us to point to a possible explanation of the conclusions which he has reached, and if our explanation is correct we should have very little difficulty in agreeing with his conclusions, our answer being, however, that a mild steel properly made is much better than a hard steel, which he praises.

DRIVING TIRES.

4. Several years ago our attention was directed to the question of *tires* on locomotive driving wheels, which, as is well known, are made of steel. The question under discussion was the possibility of preparing specifications for locomotive tires, and, as a preliminary study, examination was made of a number of steel tires which had been in service. For a number of years past the practical men in charge of the lathe shops on different portions of the Pennsylvania Railroad where tires are turned off noticed, and have stated in conversation, that they always had to turn off the most metal from the softest tire; that is to say, when the tires come into the shop for returning the very hard tires were the ones which had worn the most, the hardness being determined by the behavior of the tool during turning. This, of course, was simply an observation, and very little positive data could be drawn from it. Following this suggestion, however, a number of tires were measured, the method being to take the circumference of two tires on opposite ends of the same axle. These tires, as is well known, are of practically the same size when they go into service, the variation being possibly not more than $\frac{1}{150}$ or $\frac{2}{150}$ in. in diameter between the two tires on opposite ends of the same axle. They also, as is well known, make the same number of turns, doing the same amount of service, . . . so that it would seem that locomotive drivers afford an admirable opportunity for the use of the comparative method of making tests on the relative wear of hard and soft steel. In view of this consideration, a number of tires were taped as they came in from service to be returned, and in a short time three pairs of tires were found which showed marked differences in circumference. The circumference was measured by putting a tape around the tire. In one case the difference in circumference was 2 in., and in each of the other cases the difference was 1¾ in. This difference in circumference corresponds to a difference in diameter of from 0.55 to 0.63 in., or from 0.27 to 0.31 in. in the thickness of the tire itself. . . . Analyses were made of the metal taken from these tires. The results of the analyses are as follows:

Analyses of unequally worn tires from opposite ends of the same axles on the Pennsylvania Railroad Locomotives.

	Least worn tire.	Most worn tire.
Engine 654.	Per cent.	Per cent.
Carbon	0.594	0.708
Manganese	1.076	0 938
Phosphorus	0.039	0.101
Silicon	0.245	0.143
	Least worn tire.	**Most worn tire.**
Engine 136.	Per cent.	Per cent.
Carbon	0.541	0.625
Manganese	0.880	0.974
Phosphorus	0.062	0.063
Silicon	0.253	0.153
	Least worn tire.	**Most worn tire.**
Engine 626.	Per cent.	Per cent.
Carbon	0.525	0.554
Manganese	0.512	0.714
Phosphorus	0.032	0.037
Silicon	0.179	0.208

The tires of engine 654 had a difference in circumference of 2 in.; the other two had a difference in circumference of 1¾ in. It is interesting to observe that in every case the carbon is lowest in the least worn tire, indicating the softest steel, so far as carbon is concerned. Again, in two of the three, the manganese is lowest in the least worn tire. In one of the three there is quite a difference in phosphorus, the lowest being characteristic of the least worn tire, the other two having very slight differences in phosphorus. In two the silicon is highest in the least worn tire, while in the other the difference is the other way. Of course it is impossible to draw any very general conclusions from so small a number of samples as three, but the teaching of these results would seem to be that, in general: *lower carbon and manganese and higher silicon are characteristic of tires which give the best wear.* It is fair to say, in this connection, that it is not at all impossible that the temper of this steel may have an influence on the wear, apart from the chemical composition. [The author explains how there may be a difference in temper from different conditions in setting the tires.] It is difficult to conceive of anything which produces wear in rails different from that which produces wear in tires; since, if we understand rightly, it is a strain between the wheel and the rail which causes the rupture or tearing off of the small particles which we are accustomed to call "wear." It would seem, therefore, that tires afford an admirable opportunity for studying the question of relative wearing power of hard and soft steel, and the experiments alluded to in the early part of this paper are the experiments on the wear of tires. A method has been devised, we think, and the number of hard and soft tires compared is sufficiently great, it is hoped, to enable very positive information to be obtained as to the relative power of hard and soft steel to resist wear. It would hardly be wise to enter into the details of the method of these experiments at the present moment, but it seems probable that within six months, or possibly a year, we may have considerably more light on the relative wearing power of hard and soft steel than we now have.

THE WEAR OF ALLOYS.

5. Our studies on wear have not been confined wholly to the behavior of iron and steel under abrasion or rolling friction. A very large number of experiments have been made on the Pennsylvania Railroad with various alloys used as bearing metals, and instructive information may be drawn, we think, from these experiments as to the relation between wear and the chemical and physical properties of metal. If the experiments just alluded to may be trusted, and our deductions from them are correct, we find the same thing in the realm of the alloys which we have heretofore claimed with regard to iron and steel—namely, that those alloys which are least brittle, or, for want of a better word, those alloys which may be called softest, give the best wear—that is, they lose less metal under the same conditions than harder or more brittle alloys. Or, looked at in the light of definite physical properties, those alloys which give the slower wear are characterized by lower tensile strength and greater elongation than is characteristic of those giving more rapid wear.

The alloys experimented with have been principally the old copper-tin alloy (seven parts copper to one of tin), and alloys of copper, tin, and lead, with and without phosphorus and arsenic. It is not intended to say that no other alloys have been experimented with, but these are the alloys which have been most experimented with, and in regard to which we have the most reliable data. The method of experimentation has been to have a certain number of bearings made of a standard bearing metal, which will be described later on, and the same number of bearings of the experimental metal. These bearings were placed on opposite ends of the same axles, either on locomotive tenders or on cars, one-half of the standard and experimental bearings being on one side of the car and the other half being on the other side, but in all cases a standard bearing and an experimental bearing on opposite ends of the same axle. The bearings were all carefully weighed before going into service, and after a sufficient lapse of time were taken out and reweighed. At first an attempt was made to give the loss of metal by referring it to the mileage, but the method of comparison was ultimately adopted, as giving results free from any possible difficulties introduced by mileage, so that all the results which we obtained are strictly comparative.

The standard bearing metal is what is known in the market as phosphor-bronze bearing metal, technically described by the Phosphor Bronze Smelting Co. as the "S Bearing Metal." This metal contains approximately 79.70 per cent. of copper, 10 per cent. of tin, 9.50 per cent. of lead, and about 0.80 per cent. of phosphorus. It is, of course, a fair question, and one which has not been overlooked, whether the standard bearing metal gives uniform wear. A large number of experiments have been made on this point, the result being that the average wear of standard phosphor-bronze, compared with the mileage, is best expressed by saying that the phosphor-bronze bearing metal loses one pound of metal, worn off, for every 18,000 to 24,000 miles of travel. This, it will be observed, shows a discrepancy in the wear of the standard phosphor-bronze bearing metal, and the fact led us to abandon the method of making comparisons by mileage. The reasons for the discrepancy are not hard to find: First, the pressure per square inch in all tests were not the same, and consequently the wear would not be the same. On the other hand, with bearings on the opposite ends of the same axle, the pressures per square inch are approximately the same. Second, the state of the lubrication in different cars and engines, which is more or less characteristic of different parts of the road, is a very important variable, and undoubtedly goes far towards explaining the differences in mileage above given. This variation in the state of lubrication is not so apt to be characteristic of opposite ends of the same axle as it is of different cars and locomotives. We are inclined to think, therefore, that the assumption that standard phosphor-bronze is sufficiently uniform in its behavior to warrant its being used as the basis of comparison will not lead us into serious error, at least if we confine ourselves to a direct comparison of the loss of metal obtained from standard bearings on one end of the axles and experimental bearings on the other end of the same axles. Usually 16 bearings of each kind were put in service as a preliminary experiment, and if the metal proved at all favorable on this preliminary trial, a larger trial, embracing 50 or 100 bearings of each kind, was put in service. The preliminary trials were usually made on locomotive tenders, where the bearings get the best possible care. The larger trials were more commonly made on cars. Of course, owing to the exigencies of the service, it sometimes happened that some of the bearings put in use were not returned to be weighed. This was more true where bearings became heated, and were removed at different points along the line, than at the regular inspection points. Whenever, from any cause, a bearing was missing, its opposite was not taken into account, so that in reality in the results given the comparisons are strictly between the same number of standard and experimental bearings on opposite ends of the same axles. Sometimes as high as one-half the bearings in an experimental lot would be lost. In other cases nine-tenths would be returned. The results of the tests with the composition, and, so far as our knowledge goes, the physical properties of the various alloys tested, are given below. It is unfortunate that in the earlier tests the physical properties of the alloys were not taken. In the composition, approximately average analyses are given rather than a special analysis of the metal in each test, and it will be observed that there is no allowance

made for the small impurities, such as zinc, antimony, iron, etc., which are usually characteristic of commercial metals used in making these alloys, especially where some scrap is used in making the bearings, as is almost always the case. It will also be observed that in all cases, in expressing the loss of metal by wear, the results are given in percentages of the metal lost by the standard phosphor-bronze.

COPPER-TIN VERSUS PHOSPHOR-BRONZE.

	Composition copper-tin. Per cent.	Composition phosphor-bronze. Per cent.
Copper	87.50	79.70
Tin	12.50	10.00
Lead	None.	9.50
Phosphorus	None.	0.80

Wear.—First experiment, copper-tin wore 48 per cent. faster than phosphor-bronze; second experiment, copper-tin wore 53 per cent. faster than phosphor-bronze; third experiment, copper-tin wore 47 per cent. faster than phosphor-bronze.

ARSENIC BRONZE VERSUS PHOSPHOR-BRONZE—FIRST EXPERIMENT.

	Composition arsenic-bronze. Per cent.	Composition phosphor-bronze. Per cent.
Copper	89.20	79.70
Tin	10.00	10.00
Lead	None.	9.50
Phosphorus	None.	0.80
Arsenic	0.80	None.

Wear.—Arsenic-bronze wore 42 per cent. faster than phosphor-bronze.

ARSENIC-BRONZE VERSUS PHOSPHOR-BRONZE—SECOND EXPERIMENT.

	Composition arsenic-bronze. Per cent.	Composition phosphor-bronze. Per cent.
Copper	89.20	79.70
Tin	10.00	10.00
Lead	7.00	9.50
Phosphorus	None.	0.80
Arsenic	0.80	None.

Wear.—Arsenic-bronze wore 15 per cent. faster than phosphor-bronze.

ARSENIC-BRONZE VERSUS PHOSPHOR-BRONZE—THIRD EXPERIMENT.

	Composition arsenic-bronze. Per cent.	Composition phosphor-bronze. Per cent.
Copper	79.70	79.70
Tin	10.00	10.00
Lead	9.50	9.50
Phosphorus	None.	0.80
Arsenic	0.80	None.

Wear.—Arsenic-bronze wore 1 per cent. faster than phosphor-bronze.

DAMASCUS BRONZE VERSUS PHOSPHOR-BRONZE.

	Composition damascus bronze. Per cent.	Composition phosphor-bronze. Per cent.
Copper	77.00	79.70
Tin	10.50	10.00
Lead	12.50	9.50
Phosphorus	None.	0.80

Wear.—First experiment, damascus bronze wore 8 per cent. slower than phosphor-bronze; second experiment, damascus bronze were 7.30 per cent. slower than phosphor-bronze.

	Composition alloy "B." Per cent.	Composition phosphor-bronze. Per cent.
Copper	77.00	79.70
Tin	8.00	10.00
Lead	15.00	9.50
Phosphorus	None.	0.80

PHYSICAL PROPERTIES.

	Alloy "B."	Phosphor-bronze.
Tensile strength, per square inch, pounds	24,000	30,000
Elongation, per cent	11	6

Wear.—Experimental alloy "B" wore 13.50 per cent. slower than phosphor-bronze.

If we interpret the above results correctly, they indicate: 1, that copper-tin wears nearly 50 per cent. faster than standard phosphor-bronze; 2, that arsenic bronze, containing no lead, wears about 42 per cent. faster than phosphor-bronze; 3, that arsenic-bronze containing 7 per cent. of lead wears less rapidly, the exact figure being 15 per cent. faster than phosphor-bronze; 4, that arsenic-bronze containing the same amount of lead as phosphor-bronze wears but slightly faster, the figure being 1 per cent.; 5, that damascus bronze containing as high as 12.50 per cent. of lead wears from 7 to 8 per cent. slower than phosphor-bronze; and, 6, that the experimental alloy "B," containing less tin and more lead than any of the other alloys experimented with (the figures being 8 per cent. of tin and 15 per cent. of lead, instead of 10 per cent. of tin and 9.50 per cent. of lead, as is characteristic of phosphor-bronze) wears 13.50 per cent. slower than phosphor-bronze. This last alloy is the only one of which we have the physical properties compared with phosphor-bronze, and it will be observed that it has considerably lower tensile strength with greater elongation than the phospnor-bronze. This characteristic of lower tensile strength and greater elongation, it will be remembered, is the same characteristic which has been so often alluded to in the case of steel—namely, the mild steel, which, as is well known, is characterized by lower tensile strength and greater elongation than harder steel, gives the best wear. Here, too, in the realm of alloys, that metal which gives the lower tensile strength and greater elongation, if our experiments can be trusted, gives the slower wear. As has already been stated, it is unfortunate that the physical tests of all the other experimental alloys were not taken. . . .

I will add for information that the experimental alloy "B," with a slight modification so as to enable the foundry to use the large quantities of phosphor-bronze scrap which the Pennsylvania Railroad possesses, and which results in giving from 0.10 to 0.20 per cent. phosphorus in the finished bearing—the percentage of the other constituents being those given above—is now the standard bearing metal of the Pennsylvania Railroad, and no information has been obtained during some six years of constantly increasing use of this metal, which would controvert the conclusion given above, that the experimental alloy "B" wears slower than standard phosphor-bronze.

It is possibly hardly necessary to add that we are not able to draw from our experimental work in the realm of alloys any other conclusion than that those alloys which are least brittle, or, measured in technical language, which have lower tensile strength and greater elongation, give better wear as bearing metal than those alloys in which the reverse is the case; or, in other words, that in the realm of the alloys, so far as our experiments have gone, the same thing holds true which we have heretofore found in regard to steel—namely, the softer metal gives the better wear.

THEORY OF WEAR.

A few points further in regard to wear. We are not aware that any attempt has ever been made to formulate the variables on which wear depends; or, in other words, to enunciate a theory of wear, and it is entirely possible that the data in our hands, which are reliable enough to be so used, are not at all sufficient to warrant us in making such an attempt. Our observations, however, have led us to philosophize on this subject, and at the risk of saying something which future experiments may very greatly modify, or possibly show to be fallacious, we will venture to state a few of the variables which enter into wear.

Of course, wear is influenced by the conditions under which it takes place, but it is not our purpose to discuss these variables which may fairly enough be called "concomitant conditions." We will, therefore, not discuss lubrication, pressure, speed, temperature, rolling friction, or abrasion, nor indeed the nature of the two metals rolling or sliding over each other, but will confine ourselves wholly to the qualities of metal, which, all other things being equal, give least loss of substance by wear under the same service. To our minds we are justified in assuming that at least three elements enter into the problem of wear.

1. That metal which will suffer the most distortion without rupture will wear best. This quality of metal is usually measured or expressed in figures by the well-known physical data "elongation" or stretch before rupture in the common physical test. Possibly the experimental data on this point is greater than we possess on any other of the variables which enter into wear. If we may trust the data which we have brought forward, and the conclusions drawn from them, in all cases the greatest elongation is characterized by the best wear; or, according to the law, that metal which is characterized by the greatest power to resist distortion without rupture will wear best.

2. The first variable being obtained in satisfactory amount, an increase in tensile strength will add to the wearing power of the metal. The diminution of tensile strength, which is characterized by the better wearing metals, according to our data, is not, if we are correct, a desiraole quality. It is a concomitant of most metal that as it increases in its power of elongation, or stretch, before rupture, it diminishes in tensile strength. If, on the other hand, a new metal could be found which, with any given elongation, was characterized by a higher tensile strength than some old and well-known metal with the same elongation, the new metal would, if the theory is correct, wear better than the old one. It is not difficult to say why an increase in tensile strength should be valuable in assisting wear, provided the power of distortion before rupture is not interfered with. Wear, as we understand it, is the tearing off of minute particles, and if in one case it requires more force to tear off the particles than in another, the wear in that case will be slower. We have, we think, a little experimental data which points in this direction. The wear of bearings per thousand miles is about three times as fast as the wear of axles; in other words, as has already been stated, the standard phosphor-bronze bearing metal loses about a pound for each 25,000 miles that the bearing moves. The axle under it loses about a pound for each 75,000 miles, but the metal of the axle is from two to three times as strong per square inch, and its elongation is also somewhat higher than the bearing metal alloy.

3. The third variable which enters into wear, as we look at it, is what may perhaps be termed the "granular structure of the metal." This may, perhaps, best be illustrated by saying that, of two metals which have the same tensile strength and the same elongation, the one which is finer in granular structure will wear the slower. This we think will be evident by returning to our conception of what wear is—namely, the tearing off of minute particles from the worn body. If, now, at each rupture of a particle of metal, the particle torn off is in one case twice as large as in the other, the wear will be twice as rapid, and we assume that, other things being equal, the granular structure represents the size or fineness of the particles torn off at each operation during wear. We have only a little experimental data on this point. It is generally believed by those who have a chance to make observation that what is known as case-hardened iron wears better than either the wrought iron from which it is made or than ordinary hammered steel of approximately the same carbon. It has also been observed that case-hardened metal is always characterized by an extremely fine granular structure, as evidenced by the fracture. This, of course, is only an observation and cannot be taken as proving very much. It is also entirely possible that the influence of what is technically known as "tempering," on wear, may appear in the effect of the temper on the granular structure. The field is, of course, too void of experiment and too little known to warrant anything more than suggestions.

The relation and interaction, so to speak, of the three variables mentioned above is, of course, quite an unknown field. . . . The best we can say at present is that, with the light which we have, the highest tensile strength, accompanied by the highest elongation and the finest granular structure, are the physical properties which will probably give the best results in actual service where the metal is subjected to wear, and that that chemistry which will give these results in the finished product, be it in the realm of the alloys or in the magnificent field of steel metallurgy, or, possibly, in the coming field of a metallurgy based on aluminum, is the best chemistry which we, at the present moment, are able to recommend.

Apparatus for Platting the Actual Profile of Rails.

A device of this sort, invented by Mr. W. Schilling, Königlicher Regierungs Baumeister, at Stettin, was illustrated by us on Dec. 13, 1889. Since this time Mr. Schilling has made some improvements in the apparatus, bringing it into the form illustrated by the perspective cut fig. 1, showing the apparatus in position on a piece of rail. The device in its present form is practically shown by fig. 2, and lettered to show the different portions.

For the benefit of readers who do not recollect the other description a new description is given of the improved apparatus. The object of the apparatus is to measure exactly the profile of a rail in its position in the track so as to show the deformation or loss of section, in order to guard against undue weakening of the rail and a too near approach of the wheel flange to the splice bolts. It is in use by several of the railroad managements in Germany.

With the improved apparatus a profile can be taken in 1½ minutes, including the time used for setting up the apparatus and taking it off. The mechanism is held in place firmly and vertically over the rail by four set screws, three on one side and one on the other. Great facility for removal is afforded by the arrangement of the three right-hand set screws upon a swinging arm *z*, so that if the right-hand screw of the three is slightly loosened, these three screws can be swung off horizontally to one side, leaving the apparatus free to be lifted off the rail.

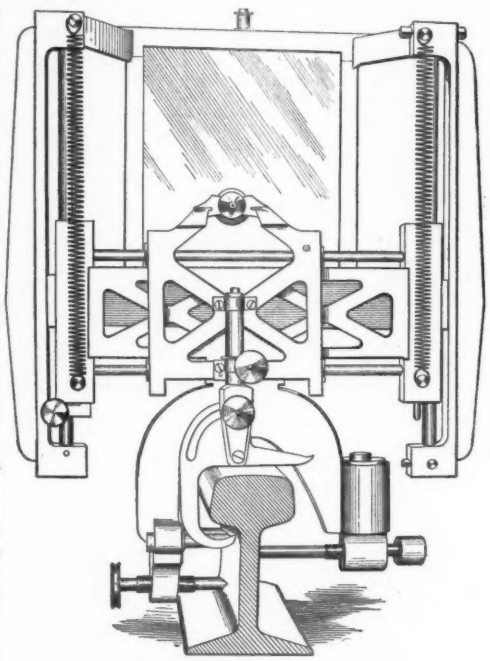


Fig. 1.

In using it, a frame, *l*, is attached vertically to the ram by means of the saddle and clamping screws, as shown. Within this frame are arranged two other sliding frames, one of them, known as the inner frame, being capable of moving laterally on the two guide rods, *w w*. These, constituting the outer frame, can, in turn, slide up and down on the rods *v v*. To counteract the slight friction of the slides, springs, shown in the engravings, are employed. The inner sliding frame carries on opposite sides a vertical rod, *u*, the height and position of which can be readily adjusted and maintained by clamp screws. This rod carries at its lower end tracing points, *r* and *r'*. The inner frame may be fixed in any position by tightening clamp screws on the horizontal and vertical guide rods.

In measuring a rail section, the tracing point *r* is passed around the rail until it reaches a point beyond which it would leave the rail surface.

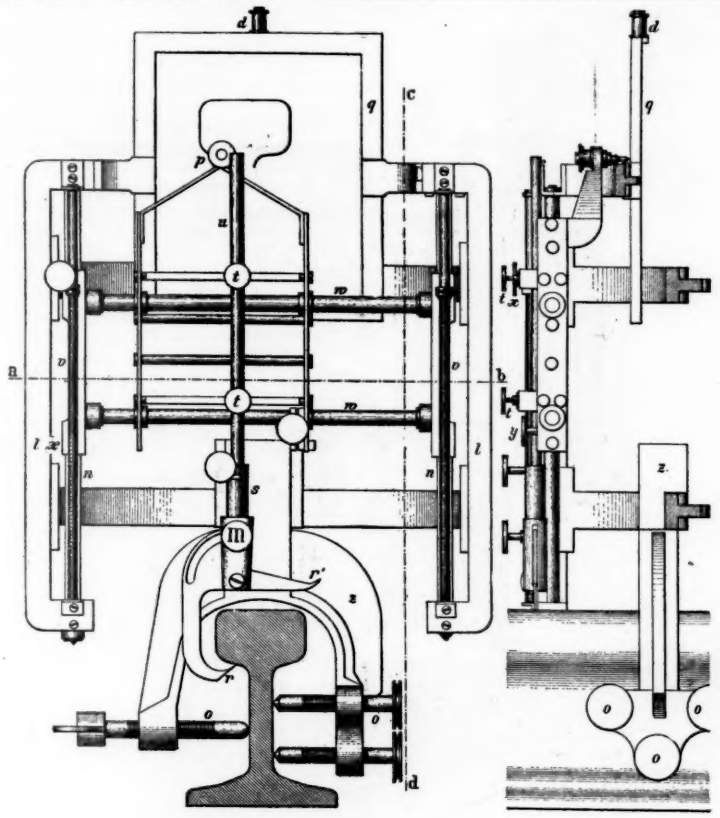
When this point is reached the point *r'* is swung down by loosening the clamp screw *m* and turning the piece to which the two points are attached through a vertical angle of 90 deg., thereby bringing the point *r'* exactly into the position of *r*. In order to do this, when the apparatus is set up it will be necessary to raise the bar *u* so as to clear the points *r* and *r'* from the rail, loosening the pencil *p* at the same time from the paper. When one-half of the rail section is complete, the points are capable of being swung horizontally through an arc of 180 deg., and the process is then repeated for the other half of the rail section. The pencil *p*, being connected by the inner frame rigidly to the tracing points in contact with the rail, makes an exact copy of the rail section on the paper resting against the frame *q*. The pencil is held in contact with the paper by a spring. The drawing-board carrying the paper is hinged to the frame *l* and held up against the frame *q* when in use by spring *d*.

Having obtained the diagram, the amount of wear of the rail is readily seen by comparison with a new rail section, the latter being drawn on tracing paper or cloth, and laid over the diagram of the worn rail.

The price asked for the improved machine is 180 marks, or about $45, and it can be obtained of the firm of Sommer & Runge, Berthold Pensky, Nachfolger, Berlin.

New England Notes.

The real New York and New England railroad is the New York, New Haven & Hartford; at least that is the road which virtually controls the railroad passenger business between New York City and the profitable territory east of it. It is true that the Sound steamers take a thousand or two passengers out of New York



Front Elevation. Side Elevation.

Fig. 2.

SCHILLING'S RAIL PROFILE APPARATUS.

daily, but in spite of this the railroad has such a large traffic that it never finds itself under any necessity to scrimp the appropriations for the operating department. While the improvement of this road to keep its facilities abreast of the demands of the traffic has, in the absence of competition, been delayed ten or fifteen years longer than it should have been, the work is now going on with considerable energy.

The line from New York to New Haven is through a very rocky country and the road as originally built was an almost continuous succession of short one per cent. grades and three degree curves, and the construction of additional tracks and straightening of the line is therefore a slow and expensive process. The four-track section already completed, from New Rochelle to Port Chester, N. Y., 10 miles, is one of the best pieces of road in the world. The permanent way is ballasted with stone, and there are no grade crossings. There are but very few switches and no unprotected facing-points. In fact, the elimination of switches has perhaps been carried too far; one or two freight stations which apparently do considerable business are connected with only one main track, so that all freight from one direction must be carried by and brought back several miles. The block system is in use, but the block operators apparently have no control over switches located midway between signal stations; neither are the block stations provided with distant signals. But aside from these features the arrangements are excellent. New passenger stations have been built at all the places on this four-track section, and they are all of stone or brick and of handsome design. To many tastes the appearance of these stations is in several features superior to that of the type so common on the Boston & Albany. The platform roofs, which can hardly be otherwise than a disfigurement to any station, are here very high, and, except in one instance, of ample length. They are of the style made familiar by the illustration in the catalogue of the builders, the Berlin Iron Bridge Co. While a high structure presents an imposing appearance which is in pleasing contrast to the squatty sheds formerly in vogue, there can be no question that the latter are much more effective for the main purpose that such structures are intended to answer, that of protecting people from rain and snow. Fences have been erected at these stations, separating the two middle tracks from the two on the outside, but opening gates in these fences appears to be the only provision for letting passengers across the tracks, except at New Rochelle, where an overhead bridge is provided. At two or three places the old station building, or a small one erected in place of it, has been fitted up for a waiting room on the side opposite to the main passenger station, and it is likely that a ticket office will be provided in these rooms, a quite unusual accommodation for small stations.

But while the New Haven road has such a complete monopoly of the Eastern traffic out of New York City, it labors under irksome restrictions in getting to and from the city proper, as most readers know. One of these is that it must put up with the New York Central as a bed-fellow; and to all practical purposes the Central occupies two-thirds of the bed, a state of things always disagreeable to the smaller fellow. One of the first sounds that cheers one's ears as he enters a New Haven train in the Grand Central station is a sudden and unearthly blast from a pop-valve on a New York Central locomotive standing on an adjoining track. The next outrageous noise, however, is a long and loud blast from a factory whistle near by, reminding one that railroads are not the only destroyers of quiet and that New York City is in this respect no more advanced in civilization than a remote country village. The Central is slowly working toward the completion of the four-tracking of that portion of its road used by the New Haven trains, and the latter will by and by be relieved of numerous causes of delay that have hindered them daily for years. It is to be observed, however, that some of these delays are the result merely of careless arrangement of time tables. Trains of the two companies are allowed to get in each other's way when a very little co-operation would obviate the difficulty.

The roadbed of the New Haven road rides very smoothly all the way to Springfield, the track being all ballasted with stone except a short piece which is soon to be rebuilt. The Boston & Albany is in the same box with most other roads, and treats its passengers to liberal doses of dust. A less excusable fault, however, is found in the way its frogs are put down, the most noticeable incident connected with the change from the New Haven tracks to those of this road being the decided side thrust given to the car as it strikes some of the frogs and guard rails.

The Boston & Albany has been making some changes in its interlocking signals, and some of them seem to be open to the same criticism mentioned in the *Railroad Gazette* a few weeks ago in connection with an interlocking plant on another road, viz., the location of home signals beyond the fouling point. The occasion of this deviation from correct practice seems to have been the same here as there—the inconvenience or expense of erecting an overhead bridge. The signals that have been changed were formerly dwarfs and stood between the main tracks, where the space was very limited; the semaphore arms had been cut off until their length was not much greater than their breadth, and finally they were taken out altogether. Another particular in which these signals vary from what has been agreed upon by the best experts as a settled principle is the use of two separate posts for arms governing trains on one track. For a facing point switch a runner approaching on the main line encounters two posts, each carrying a single arm, one for the main route and one for the side track. Why these arms should not both be on the same post is not apparent.

The elegant new double passenger station at Springfield, illustrated in the *Railroad Gazette* of March 14 last, is now in use, but the long covered platform between the two tracks is not yet finished. Local enthusiasts call this "the finest half way station in the country," and refer to that in Hartford as an apology. This view of the Springfield station has a large element of truth, the tracks and platforms being arranged to accommodate trains of almost unlimited length. As the reader will remember, the advantages of a train shed have been sacrificed. This idea has been carried to such an extent that the platform roof stands so far from the track that in even a moderate rainstorm an umbrella is a necessity in getting on or off the cars, at least in the case of ladies with $20 bunches of millinery on their heads. The space is apparently 18 in. or more. The Springfield station has one rare accessory which deserves special mention, and that is a crier who announces the trains with perfect distinctness. Criers of the right kind seem to be born and not made, and it is to be hoped that many superintendents will therefore keep their detectives on the watch for suitable candidates for places of this kind. The Springfield man not only speaks clearly, but gives in concise terms *all* the information needed.

The stone arch bridge over Main street, which is a principal feature in the improvement at this point and which was not completed at the time the description of the station was published in the *Railroad Gazette*, is a handsome structure. As viewed from the cars its beauty is not striking, the round towers at the four corners, which are the most noticeable feature, producing no specially favorable effect at such short range. But the view from the street is highly satisfactory, the disfigurement of the highway, which was unavoidable, being very largely offset by the bold manner in which the problem was treated. The material of the face of the arch and of the wing walls, which on one side extend several hundred feet (toward the station), is granite, of a reddish hue, from the quarries of the contractors, Norcross Bros., at Milford, Mass. The color is not only such as to give warmth to the general aspect while the structure is new, but is evidently one which will suffer from the discoloring effects of rain and dirt less than most other stones of equal hardness.

The slur on the Hartford station, above referred to, is hardly warranted by the facts. This station, completed about a year ago is, as most of our readers know, one in which trains enter at the upper level, the waiting rooms being on the street floor. The New York & New England uses it jointly with the New York, New Haven & Hartford, while the Central New England & Western has erected a new independent station across the street. There is no roof over the tracks, but quite satisfactory under footways are provided, so that passengers can reach most of the trains from the waiting room without exposing themselves to rain. The most noticeable defect in the general plan is the comparatively long flight of stairs from the waiting room up to the track level, the height of the latter above the street being unusually great. It would seem as though this fault could have been avoided to a large extent by making more steps between the street and the waiting room, or by breaking the main flight of stairs into two or more sections. The plan of this station was agreed upon only after much negotiation, and there was an appeal to the Railroad Commissioners by a large body of complainers after the station was put in use, but the grievances of these people were very largely based on defects of management and other troubles due to a lack of attention to details.

The Pullman Sash Balance.

This device, which is shown in a perspective drawing, has been somewhat recently put on the market, and is being well received. Its object is indicated by its name. It is inserted in the frame of the window, and the sash suspended from the loop which is shown in the illustration. The balance consists of a drum about 2½ in. in diameter by 1 in. thick, in which is coiled a clock spring around an arbor. The suspending ribbon, which is shown, is of copper, and about 26 in. long. This is wound around the drum, and consequently the tension of the spring in the drum acts to counterbalance the weight of the sash.

The Pullman Sash Balance.

On the top of the apparatus are shown a tension screw and spring. By means of this screw the brake may be pressed with more or less tightness against the copper ribbon. This brake is of steel, with a bit of felt inserted

to rub against the copper. Of course, its scope is quite limited, but it is intended to adjust the balance spring to within one or two pounds of the weight of the sash. The frame which carries the drum is of steel and is riveted to the face plate, which is of brass. This apparatus is made by the Pullman Sash Balance Co., Rochester, N. Y.

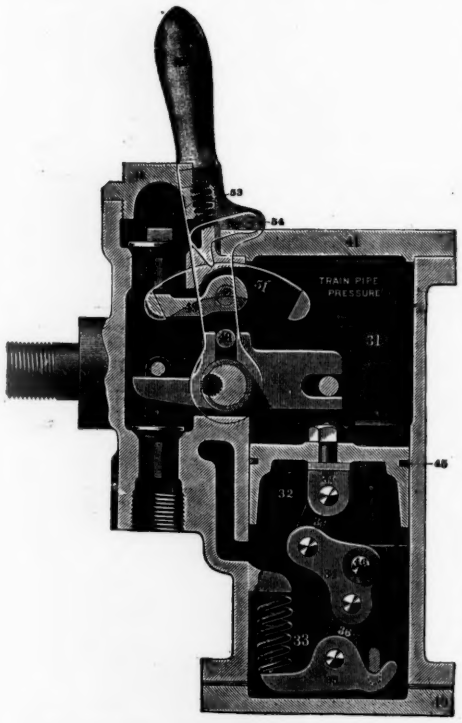
The New York Air Brake.

The engineer's valve and the quick-action triple valve of the new compressed air brake apparatus of the New York Air Brake Company are shown in section in the engravings which accompany this article.

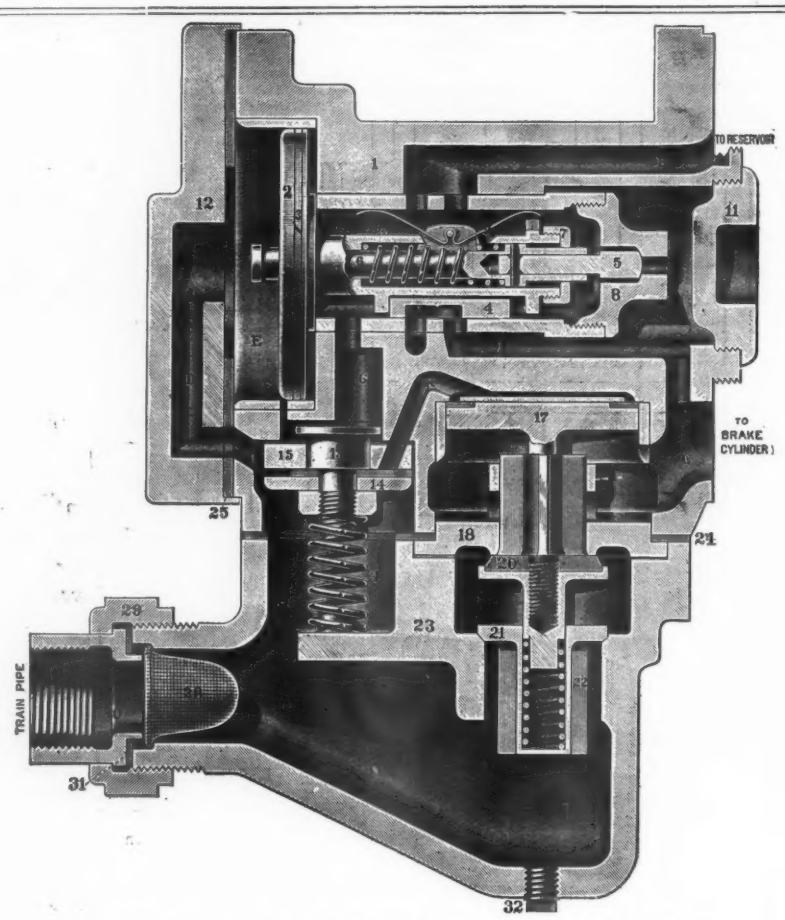
The engineer's valve operates under differential pressures. On the opposite ends of a lever, 43, which is free to rotate about the pivot 44, are connected a train pipe air valve, 42, and a piston, 32. Above the piston is the train pipe pressure and below it the main drum pressure, and any difference in these causes the piston to move against the resistance of the spring, 33, through the medium of the bell crank levers. This spring holds the piston down as long as the pressures on the opposite sides of the piston are equal; when unequal, the piston rises to a point of equilibrium. This point is soon reached, because the leverage of the spring pulling on the piston increases as the piston rises, while that of the piston decreases. The distance which the piston rises depends upon the reduction of pressure in the train pipe. When the handle 50 is thrown to the right the eccentric shaft 44 causes the fulcrum of the lever 43 to be lifted; this raises the valve 42, which remains open until the reduction of pressure above the piston permits it to rise and the lever 43 to revolve, thus allowing the valve 42 to seat. It is evident that the amount of air let out will depend upon the movement of the handle, which varies the lift of the fulcrum of the lever, as described.

The reverse of the action just described occurs when the handle is moved to the left. This opens valve 39 and allows the air to pass from the reservoir to the train pipe, but as the piston descends in proportion as the pressure above it approaches the pressure below it, the lever 49 will be drawn away from valve 39 as soon as the piston has descended a distance corresponding to the movement of the eccentric pin by the handle. By this means any desired excess of pressure may be maintained in the reservoir by stopping the handle at any desired point. On the outside of the valve case are a graduated arc and a spring catch, which hold the controlling lever in any desired position.

In the quick-acting triple valve the piston is actuated by a differential air pressure, and in its movement carries with it a slide valve and a spindle graduating valve, as shown, in a manner not unlike other triple valves. The quick-acting feature is different. Air from the train pipe passes to cylinder *E*, and thence through passage *F* and *G* to chamber *H*, and then through passage *B* to the auxiliary reservoir. When the train pipe pressure is reduced the piston 2 moves its full stroke, first shutting off the auxiliary reservoir from the train pipe by closing the connection between passage *F* and cylinder *E*, next closing exhaust valve 4 and opening graduating valve 5, which will admit air to the brake cylinder. If the train pipe pressure is reduced but little, the pressure in the reservoir is soon reduced to less than the train pipe, and the piston 2 starts back and closes graduating valve 5 without disturbing valve 4, which is held with some force by the air pressure, and checks the return stroke when valve 5 is seated. A further reduction in the train pipe would repeat the same action and apply the brakes a little harder. If the train pipe pressure is reduced 8 or 10 lbs., the graduating valve 5 will remain open and the brakes go full on, as for a service top. An increase of pressure in the train pipe will cause all the valves to move back to the position shown in the engraving, thus releasing the brakes and allowing the reservoir to be recharged.



Engineer's Valve—New York Air Brake Company.



QUICK-ACTING TRIPLE VALVE—NEW YORK AIR BRAKE COMPANY.

The emergency valve 19 is actuated by piston 17, which is controlled by valve 14. A quick reduction of 15 or 20 lbs. in the train pipe pressure causes valve 14 (which is a piston exposed to reservoir pressure on one side and train pipe pressure on the other side) to open and admit pressure through *K* above piston 17, which then opens valve 19 and allows air from the train pipe to pass check valve 21 and enter directly into the brake cylinder through passage *C*, thus quickly reducing train pipe pressure to actuate valves on succeeding cars, and at the same time applying the brakes with a greater force than would be possible if the brake cylinder received air from the reservoir only. An increased pressure in the train pipe causes all the valves to return to the position shown and release the brakes.

The Time Convention.

The fall meeting of the General Time Convention was held at the Hotel Brunswick, New York City, on Wednesday of this week, the President, Col. H. S. Haines, in the chair. About 90 representatives were present. The date fixed for the change of time is Nov. 16. The Executive Committee reported 169 companies as members of the convention, operating 121,442 miles of road. A revision of the rules of order will be presented for action at the next meeting.

The president, in opening the meeting, delivered an interesting address concerning the various departments of work now before the convention. Col. Haines thinks that the Train Rule Committee can yet do much good work and that some of the rules could with advantage be made more full and explicit than they now are. As the block system is expensive, measures must be taken to improve our present practice. The engineer of a train ought to take more active interest in protecting the rear of the train, and, indeed, he being generally the most intelligent man on the train, should have more specific authority over the rear brakeman, telling him, by signal, when to go back. Fusees should be more generally used, and by the engineer as well as by the rear brakeman. Engineers should be instructed to drop off a fusee one mile before reaching a point where he intends to stop or to slacken. Col. Haines and his subordinates have had highly satisfactory experience with fusees.

Col. Haines next took up car service, strongly urging the importance of the per diem system of settling for interchange. On the work of the Committee on Safety Appliances he said:

The field of this committee is as extensive as it is important, and the public as well as our own members will await its conclusions with interested expectation. Those conclusions will not be of a technical but of a practical character. The committee will not delve into the records of the Patent Office, nor will it require a laboratory or a test yard. These matters will be left to the several technical associations and to the restless ingenuity of the American inventor. It is for that committee to determine, first, that there exists in some department of railroad operation a necessity for means of safety additional to those in general use, a necessity so extensive and so urgent as to call for united action on the part of our members; next to ascertain what appliances there are which they consider suited to meet that necessity, or if such appliances do not exist to state what the requirements are and to recommend that they be brought to the attention of the technical associations which are organized and equipped for the proper investigation of such matters. The principal aid which the General Time Convention can give to the introduction of meritorious safety appliances is to provide for their simultaneous adoption. This will hasten the general use of automatic couplers and continuous brakes on freight trains, of improved methods of lighting and heating passenger trains, and all devices that must be made interchangeable in order to be applied in through train service over connecting roads; and here is the field for the Committee on Safety Appliances. In this field it will collect and publish statistical information that will be of value because obtained at first hand and from authoritative sources. In obtaining this information the committee should have the prompt and cordial support of our members, and their circulars should have immediate and careful attention in order that its reports may neither be unnecessarily delayed nor based upon scanty or erroneous data. As I stated in my opening remarks, the matter which serves for our semi-annual meetings is the result of the assiduous and unselfish labors of these committees, and to them is due the gradual transformation of the General Time Convention from a schedule-making body to an association of the railroad companies organized for mutual benefit in the development and solution of problems connected with railroad management.

The Car Service Committee made a report consisting chiefly of statistics, among which is the statement issued by the National Association of Car Service Managers and reported in the *Railroad Gazette* of Sept. 12. Statistics of car movement for six months are given from about 50 roads. Each road reports the mileage of foreign cars on its lines, of its own cars away from home, and of its own cars on its own road. We give a few extracts from the first and third columns, these figures being the averages for six months.

AVERAGE MILEAGE OF FREIGHT CARS PER DAY.

	Borrowed cars.	Road's own cars at home.
Baltimore & Ohio	31	27
Burlington & M. R.	29	28
Central of New Jersey	29	33
Chicago & N. W	27	36
Chicago, Burlington & Q	51	33
Cincinnati, Wabash & M	14	15
Fitchburg	22	19
Lake Shore & M. S	36	39
Louisville, N. O. & Texas	14	14
Missouri, K. & T	39	35
New York, L. E. & W	28	29
Northern Pacific	25	33
Pennsylvania lines west of Pittsburgh:		
N. W. System	31	25
S. W. System	36	30
Pennsylvania Railroad	33	28
West Shore (January, April and June)	41	46

Only thirteen roads could be compared with the same period of 1889. On these the averages were as follows (miles per day):

	1890.	1889.
Cars lent	23.27	24.25
Cars borrowed	29.32	29.65

The general average was somewhat reduced by the floods in the Mississippi Valley, one road reporting an average for April of less than four miles per day.

There are now 27 demurrage associations in successful operation. The Time Convention form of agreement and by-laws has been generally adopted by these associations. The committee recommends leaving to the National Association of Car Service Managers all questions of detail, but urges a strict compliance with the principles laid down by the convention. No action is recommended concerning per diem car service. The report was accepted.

The report of the Committee on Safety Appliances (abbreviated) says: Comparatively few answers have been received to its circulars, but it so happens that there is sufficient consensus of opinion to warrant the resolution, "That the Committee on Safety Appliances recommends to the General Time Convention the adoption of the Master Car-Builders' type of automatic freight car coupler as the standard of its members."

The committee does not feel that at present it can go further. There are those who believe that the proportion of personal injuries brought about by the act of coupling with the link-and-pin is not so great as popularly supposed, and that careful methods, if rigidly adhered to, can to a considerable extent reduce the casualties so engendered; but the committee is equally strong in the belief that our true policy, to place it on no higher ground, is to continue the research for well-tested and successful safeguards against even what may be by some considered carelessness or recklessness on the part of those whose functions are such as to expose in any degree their lives or limbs.

The committee next proposes to take up the subject of train heating, assuming that during the coming winter many railroads will experiment with—indeed, some adopt—appliances other than the ordinary car stoves or heaters. . . . The committee will try to gather the teachings of their experience, and report to the next meeting.

The committee submits a synopsis of the legislation adopted in the United States bearing upon the subject of safety appliances. The indications are that unless the railroad companies themselves provide efficient appliances they will be constrained to follow systems which they esteem ill adapted to the end in view.

E. T. D. MYERS,
J. G. METCALFE,
J. M. WHITMAN,
JOHN ADAMS,
C. D. HAMMOND,
W. F. MERRILL,
J. A. FILLMORE,
J. T. ODELL,
} Committee.

The report was adopted with only two negative votes.

The members of the committees on Car Service and on Safety Appliances, whose terms had expired, were re-elected. The Chicago, Burlington & Quincy was elected to take the place of the Union Pacific, whose representative, Mr. Dickinson, has gone to the Baltimore & Ohio, which is already represented by Mr. Odell on the same committee.

Wooden Trestle Bridges.*

BY WOLCOTT C. FOSTER.

STANDARD TRESTLE, CHARLESTON, CINCINNATI & CHICAGO RAILROAD.

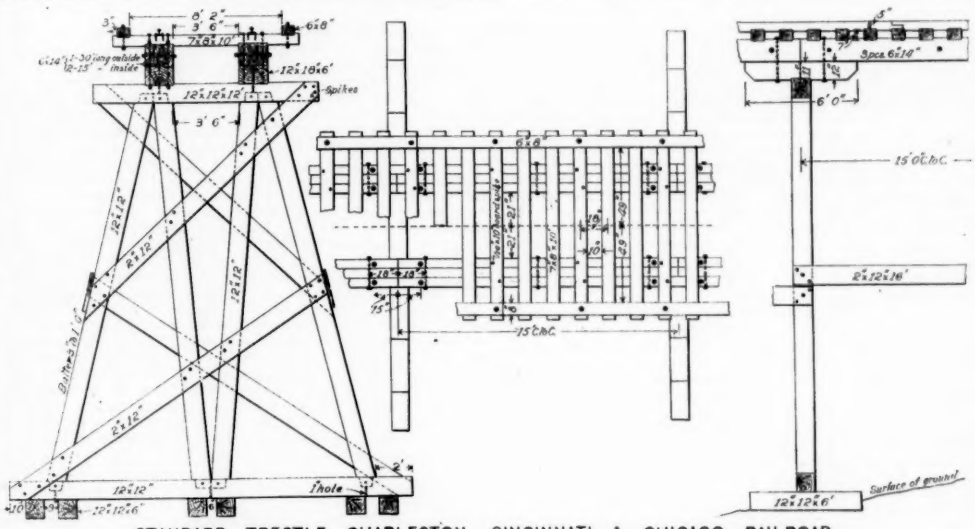
The cuts presented with this article illustrate the general plans for single deck framed trestles as built by the Charleston, Cincinnati & Chicago Railroad. They belong to the inverted W type, and so far as the bents themselves are concerned are a very good example of this style of structure. The floor system, however, is rather bad.

The guard rails are 6 in. × 8 in., laid flat, and notched 1 in. over the ties. They are placed 3 in. from the ends of the ties, and are bolted to every third tie by a ¾ in. × 15 in. bolt, having 3 in. cast washers under both head and nut. The ties, which are 7 in. × 8 in. × 10 ft., are notched 1 in. over the stringers, and every third one is spiked to the stringers by four $\frac{7}{16}$ in. × 10 in. boat spikes, staggered as shown on the floor plan. The track stringers are each composed of three pieces, 6 in. × 14 in., one of which is 30 ft. long, or long enough to extend over two bays, the remaining being 15 ft. long.

The three pieces are bolted together by ¾ in. bolts. Their faces are in contact, which is very bad practice indeed. It would be much better to separate two of the pieces by 1 in. packing washers, and use the third piece as a jack stringer. The ends of the ties would then receive some support in case of a derailment, and not be liable to break off and throw the train off of the trestle. The method of breaking the joints in the stringers is very clearly shown in the floor plan. The longest or 30 ft. stick of each stringer is always placed upon the outside. The ends of the stringers, instead of resting directly upon the caps, rest upon corbels. These corbels are solid and are wide enough to support the full width of the stringer, being 12 in. × 18 in. × 6 ft., laid flat. They are notched over the caps 1 in. and drift bolted to them by a ¾ in. sq. × 18 in. drift bolt. The stringers are fastened to each corbel by four ¾ in. bolts with 3 in. cast washers under head and nut. The use of corbels is not to be recommended in general for reasons which will be discussed more at length in a future article.

The caps, which may be either of white oak or pine, are 12 in. × 12 in. × 12 ft., and are joined to the posts by mortise and tenon joints, using one 1 in. white oak pin to each tenon. The posts are all inclined, those on the outside having a fixed batter of 3 in. per foot, while the inclination of the inner posts varies with the height of the bent. All of the posts are of the same section, that is

* Copyright 1890, by W. C. Foster, and condensed from his forthcoming book upon the same subject.



STANDARD TRESTLE—CHARLESTON, CINCINNATI & CHICAGO RAILROAD

12 in. × 12 in. The sill is joined to the posts in the same way as the cap. There is a very novel feature in the mortises in the sill, and that is the drainage holes bored through the sill from the bottom of the mortises. These holes are 1 in. in diameter, and are supposed to keep the mortises free from any water which may find its way in. In this way the life of the posts and sills is somewhat lengthened.

When the bents are over 12 ft. high sway bracing is introduced in the manner shown. It is of 2 in. × 12 in. plank spiked on by 50d. cut steel spikes as indicated.

The longitudinal bracing is also made of 2 in. × 12 in. planks 16 ft. long spiked on the same as the sway bracing midway between sill and cap.

Six sub-sills 12 in. × 12 in. × 6 ft. are placed beneath the main sill, arranged as shown on the plans so as not to interfere with the free drainage of the water from the mortises.

The bents are spaced 16 ft. from centre to centre.

Following is a list of the material required:

BILL OF TIMBER—ONE BENT AND ONE BAY.

Name.	Material.	No. of pieces.	Size.
Floor system.			
Guard rails	P.	2	6 in. × 8 in. × — ft.
Ties	P. or W. O.	10	7 in. × 8 in. × 10 ft.
Stringers	P.	2	6 in. × 14 in. × 30 ft.
		4	6 in. × 14 in. × 15 ft.
Corbels	W. O. or P.	2	12 in. × 18 in. × 6 ft.
Bent.			
Cap	W. O. or P.	1	12 in. × 12 in. × 12 ft.
Batter or outside posts	P. or W. O.	2	12 in. × 12 in. × — ft.
Inside posts	P. or W. O.	2	12 in. × 12 in. × — ft.
Sills	P. or W. O.	1	12 in. × 12 in. × — + 4 ft.
Sway bracing	P.	2	2 in. × 12 in. × — ft.
		2	2 in. × 12 in. × — ft.
Sub-sills	P. or W. O.	6	12 in. × 12 in. × 6 ft.
Longitudinal bracing	P.	2	2 in. × 12 in. × 16 ft.
Treenails or pins	W. O.	8	1 in. × 12 in.

NOTE.—In column headed *Material* P stands for pine, W. O. for white oak.

BILL OF IRON—ONE BENT AND ONE BAY.

NAME.	No.	Size.	Use.
Bolts	8	¾ in. × 15 in.	Guard rails to ties.
Bolts	8	¾ in. × 19 in.	Stringers to corbels.
Bolts	6	¾ in. × 21 in.	Stringer pieces together, packing bolts.
Drift bolts	2	¾ in. sq. × 18 in.	Corbels to cap.
Boat spikes	16	7-16 in. × 10 in.	Ties to stringers.
Cut spikes	58	50 d. steel.	Bracing to posts.
Cast washers	44	3 in. diam.	Under heads and nuts of all bolts.

Recent Improvements in Air Brakes.

What follows is a paper read by Mr. H. H. Westinghouse before the American Railway Superintendents' Association at the annual meeting Oct. 7, 1890. It is slightly abridged.

Mr. Westinghouse related briefly the development of the automatic brake with the triple valve from the early "straight air" brake, and described in general terms the action of the triple valve.

Beside minor features of advantage the automatic system furnished two distinct and important advances in the art of braking; first, the time of application was much reduced, because the amount of air to be moved was but comparatively small, being that contained in the main pipe and triple valves, whereas, with the straight air brake, the entire quantity necessary to fill the cylinders was required to pass through comparatively small pipes throughout the entire length of the train. On a train of ten cars, the full application of the brakes was reduced from 25 seconds to about 8 seconds. The degree of benefit is easily understood when it is taken into account that a train moving at the rate of 40 miles an hour will pass over about 60 feet in a second. The second point of advantage, and in many respects the more important one, is automatic action, by means of which the brakes are applied when the pressure from the main line of pipe is removed, by accident as well as by design.

Another feature of great value, so far as regards the efficient maintenance of brakes, is that, as air is constantly upon the train pipes, except when brakes are fully applied, it necessitates making tight joints, and a general inspection that was not given when the straight air system was in use.

THE FREIGHT BRAKE.

Force of circumstances some years ago made it advisable that certain lines of railroad in the Western country should provide power brakes for freight trains, and as the method of coupling cars together in this service is much less secure than in passenger trains, the necessity for automatic brakes was obvious. Many cars were fitted with a design specially made for the purpose, which is not different from that used on passenger trains in principle, but slightly different in form. Comparative success in what was regarded by many as a doubtful experiment created sufficient interest in the subject to lead the Master Car Builders' Association to appoint a committee, which was authorized to make tests of various existing brakes for the purpose of determining whether any of them were suited to the requirements of freight traffic throughout the entire country. The experience of the Western lines was held to be important, but not conclusive on some essential points, and as success in operating brakes upon freight trains is dependent upon uniformity of operation and construction, it was manifestly one of the wisest and most intelligently conceived and executed investigations that has ever been conducted in connection with a determination of practical standards in railroad service. The success of car couplers and power brakes that are used upon freight trains is dependent upon uniformity, to a degree that has not and never will exist in any other of the various elements that go to make up motive power and rolling stock equipment.

Mr. Westinghouse then described the comparative failure of the air brake for 50-car trains in that the time of application on the rear cars was 18 seconds, and destructive shocks resulted. He continues as follows:

The problem was fairly presented and experiments were at once commenced, having for their object the application of the brakes so nearly simultaneously throughout a train of 50 cars as to overcome the difficulties developed by the tests. Something was gained by the enlargement of the train pipe, but as it also increased the quantity of air to be moved, possibilities in this direction were soon exhausted. Experiments already made in train air signaling demonstrated that the flow of air in pipes in very limited quantities is at the rate of about 1,000 ft. per second, and that the cause of the great time required to apply brakes by the straight air system was due to the excessive friction of the large quantity of air that was necessary to be moved. The light pulsations that will operate the delicate signaling valve were not sufficient, or of a kind that could be used in operating the stronger and less sensitive triple valve. It therefore seemed necessary that some plan should be arranged whereby, instead of reducing the pressure in the train pipe at one point only, and that at the extreme end, upon the locomotive, a plan should be provided which should admit of local and frequent simultaneous reduction on various portions of the train.

THE QUICK-ACTING TRIPLE.

The triple valve already performed many delicate operations, and it seemed almost impossible to expect more of it. It still, however, possessed some undeveloped virtues. As you are no doubt aware, it performs all operations of moderate or service application, release and recharging of auxiliary reservoirs, with but a portion of its piston movement. The final or entire travel is only used when full application is required, and it was discovered that this complete and final movement could be utilized to open a communication directly from the train pipe to the atmosphere, and thus practically make a discharge of air on every car, instead of causing it to make the long transit to and out at the locomotive. This effected a reduction in the time of application of the brakes on a train of 50 cars from 18 to 2 seconds. By further experiments it was discovered that, instead of discharging the air from the train line into the atmosphere, it was entirely practicable and highly beneficial to utilize it in the cylinder to augment and assist the pressure from the auxiliary reservoir. The changes that were necessary to construct the quick-action brake were additions, and no modification was made in the action of the triple valve, except on the sudden or emergency application, and it is only on such occasions that the added mechanism is called upon to operate.

BAD HANDLING OF BRAKES.

Reference has been made to the friction of air in pipes, and by the explanation of the quick-acting triple valve I have tried to make clear that its effect is practically nullified so far as relates to the promptness of the application of the brakes when used in emergencies, but for the purpose of graduating the brake it is still necessary to remove the air from the train pipe in the usual manner. The effect of resistance to the movement of air in the train pipe by friction is not merely that it causes the action of the brakes to be less prompt than is desirable in emergency applications, but it is the source of about all of what is known in general terms as the bad handling or manipulation of brakes. When brakes are applied uniformly to every car throughout the train the effect is the best that can be produced, but when the braking force on the separate portions of the train is different it sets up internal strains between the several cars, and these strains are the cause of the shocks and jerks that are so injurious and uncomfortable. The chief source of unequal braking pressure is the discharge of air from the forward portion of the train at a greater rate than it can be conveyed by the train pipe from the rear portion. This lowers the pressure in front below

that which exists in the rear portion, as a consequence applying the front brakes with a greater force, and creating conditions identical with those that the Burlington experiments demonstrated as so objectionable. The tendency to open the discharge valve, by too great an amount is usually accompanied by the bad habit of operating it too quickly, both in opening and closing. When the cock is suddenly closed, the momentum of the moving air in the train pipe will cause a rise of pressure in the front portion of the train, which frequently releases a number of the front brakes in the same manner as if air had been admitted to the train pipe from the main reservoir. A stretching of the train takes place due to the fact that the front brakes are released while those upon the rear portion are set with considerable force, thus creating a liability of train separation.

THE ENGINEER'S EQUALIZING VALVE.

It is clearly possible to avoid producing this uncomfortable and dangerous action by careful operation of the engineer's valve, but any one having experience in locomotive running is well aware that the engineer's time is not always available for nice manipulation of appliances of this kind, particularly as one of the most important conditions, which is the length of train, is very apt to be changed from day to day. The attempt to meet the requirements has heretofore resulted in bringing out what is known as the engineer's equalizing brake valve. Its construction is such that it provides for two distinct modes of application. One of them is the service or general application which requires a small, moderate and uniform reduction of pressure, and the other is the emergency application, which demands a sharp, instantaneous and considerable discharge of air. For service applications, the discharge port is restricted in size so that the flow of air will never be so great as to sensibly reduce the pressure in the front portion of the train faster than is done at the rear, and this construction prevents the uneven action before referred to.

The length of time that this discharge port is open depends upon the amount of air to be removed, which is, of course, in proportion to the number of cars in the train, and were it to be operated by direct movement of a valve handle it would be necessary for the engineer to delay closing the valve until the proper reduction had been made. In a train of considerable length this is a very long period and would require more attention than it is desirable to give. The length of time that this discharge is continued is therefore automatically provided for in the following manner: The valve that controls this opening is attached to a piston, similar to the triple valve piston, having the air pressure alike on both sides. When it is desired to apply the brakes, communication is closed between the two sides of the piston, and the desired amount of air is removed from the upper side. The excess of pressure underneath raises the piston, which carries the valve with it, permitting the discharge of the train line pressure into the atmosphere. When this pressure has fallen to an amount equal to that exhausted above the piston, the valve returns to its seat, and prevents further discharge of air. The only duty of the engineer is to reduce the pressure above the piston the desired amount, and as the volume of the air to be exhausted to perform this is contained in less than one cubic foot of space, it is practically instantaneous. There is every indication that this device entirely provides for one of the most serious troubles that has heretofore existed in the satisfactory and delicate manipulation of brakes, particularly upon freight trains and on long grades. The method of operation for making an emergency application is to push the handle to the full extent of its movement, which opens a large discharge port, connected directly with the train pipe, without the intervention of the valve and piston used for graduated braking.

SUMMARY.

The distinct advances that have been made in air brake mechanism recently are, therefore: First: The modification of the triple valve, whereby the application of brakes on the rear of a train of 50 cars has been reduced from 18 to 2 seconds in emergency applications, and an augmentation of the power of the brake for this service of 20 per cent. in excess of what can be had for service applications. Second: An arrangement of the engineer's valve that automatically provides for a rate of discharge for service applications that will give practically uniform braking throughout the entire length of long trains. Incidentally many details of construction have been beneficially changed, and much more sensitive action is now had from the triple valve than was possible in its earlier forms. The use of what is known as a pressure retaining valve upon heavy grades has removed one of the objections that was originally offered to the automatic form of brake for this service.

The result of these changes, stated in reasonably exact terms, will amount to an increase in efficiency of about 25 per cent. when all equipment is fitted with the new construction. The percentage of gain is, of course, greater on long trains than on short ones. In the presence of the fact that more than 50,000 of the new brakes are now in daily use, running in regular interchange with cars fitted with the old form, it is hardly necessary to state that the improvements have all been made with a thorough appreciation that nothing must be introduced that would nullify or interfere with the proper performance of brakes already in service.

There are certain features connected with the development of the air brake that are worthy of consideration, and, if fully appreciated, should lead to constantly increasing benefits. It has been frequently urged against the brake mechanism that it is too complicated. This statement will probably be true, when some form that is more simple and equally efficient is devised. If simplicity of construction and manipulation were the objects most desired, it was better attained with the straight air system than with any of the succeeding forms, and it is not probable that anything more complicated would have received consideration by railroad managers. The mechanism which it supplanted was of the crudest form. The duties of the engineer were already considered to be sufficient, and nothing short of a device that would largely work itself would have been considered acceptable at the early stages of its introduction. It was undoubtedly fortunate for the future of power brakes that the straight air system was first introduced. Succeeding changes have not been in the direction of simplification, because obvious requirements have made necessary the use of devices that would perform more important work, and while in the interest of universal symplicity, these modifications are to be regretted, yet the question is one that can only be considered from the standpoint that the value of results justifies the means employed.

BRAKE RIGGING.

I am sure that your interest in the brake question does not cease at this point, for the reason that the mechanism described is only one of the means to a desired end, and that, after all, the final result of controlling and overcoming the speed of trains is that in which you have the greatest interest. The brake mechanism is but one of the elements in securing good train stopping, and it is the one for which our company is largely responsible. The way in which this apparatus is applied, and connected to the brake shoes, and the manner in which this combination of devices is operated, is largely outside of our jurisdiction and control. I do not doubt that you will agree with me that a failure in any of the elements will cause a general failure of the attempt to control speeds. While we do not claim perfection of design or construction for our apparatus, observation has made it perfectly plain that many difficulties and many apparent failures have resulted from other defects than those for which we can be held strictly responsible.

To illustrate: As you know, there is a practical limit to the travel of the piston of the brake cylinder. If the brake connections are of a kind that will permit this entire travel to be completed without bringing the shoes against the wheel, no beneficial result will occur, although the actuating mechanism may be absolutely perfect. The condition of brake rigging, when power brakes were first applied, was of a kind fairly suitable to hand brakes. So long as the rods, levers and beams did not actually break, the hand wheel could absorb all of the lost motion due to bad connections, or all reasonable stretching and bending of levers, as there was practically no limit to the amount of chain that could be wound up on the hand brake staff. The weight of passenger cars was considerably less than it is at present, and what then constituted a reasonably strong gear for hand brakes is totally inadequate for the heavy cars now in use. This point, however, until recently received but little attention, and the weak and imperfect form of brake gear that existed many years ago has in too many instances been perpetuated. The practical result has been, as indicated, that frequently the pistons travel their entire stroke without accomplishing useful work. Many of you are probably aware that this state of affairs exists to some degree, but I do not think you appreciate the extent of it. We have in our possession the report of an inspector whose duty it was to examine brakes on one of the through lines between New York and Chicago. He was stationed at a point near Chicago, and his examination revealed that trains starting from New York with brakes presumably in good condition arrived at the point of inspection with an average of less than one-half of them in shape to do any work, on account of too great piston travel. This report extended over a period of nearly two years, and the instances were so uniform and regular as to show that it was not an occasional lack of proper inspection, but a generally inadequate brake gear. Undoubtedly more frequent inspection and a proper adjustment of levers would have reduced the number of defective brakes considerably, but I do not regard this as a proper remedy.

With levers, rods and beams sufficiently strong, the travel of the piston is enough to compensate for the ordinary wear of brake shoes for a round trip between New York and Chicago without the necessity of an intermediate adjustment or inspection, and it seems a much more rational and economical method to furnish the proper construction than to attempt to maintain a system of local inspection to provide for originally defective construction. The fact that inspectors are regularly required at other than principal terminal points is an evidence against the manner in which brakes are applied to rolling stock. I do not believe that you can overestimate the value of the point that is now brought to your notice. The one authentic instance quoted indicates a loss of efficiency that is considerably greater in extent than the amount we have gained by the invention of the quick-action brake. A conservative estimate, based upon the reports of our inspectors who regularly visit all users of power brakes in the United States, leads me to believe that one year ago the direct result of inferior brake gear was to reduce the efficiency of power brakes not less than 30 per cent. It is a matter of extreme gratification that I am able to say that a great change for the better has taken place within the time mentioned, and there is every indication that such a regretable state of affairs will not be continued by those in charge of this portion of railroad management, who are intelligently interested in the success of the corporations with which they are connected.

UNBRAKED WHEELS.

One other point in this immediate connection should not be omitted. The absence of brakes upon locomotives and upon the middle pair of wheels of cars having six-wheel trucks is a definite and determinable reduction in the power of brakes to stop trains. It sometimes amounts to a decreased efficiency of 20 or 30 per cent., and I suppose that you can imagine that this loss, combined with the one due to poor brake gear, leaves but very little for use in cases of emergency. Unfortunately, such conditions are not what may be, but what have actually existed, and in too many instances, with disastrous results. I feel quite sure that no more certain road to improvement exists than in placing definite information before those who are directly interested, and to this end we have for some time investigated every accident which in any way involved the question of power brakes, for the purpose of determining what changes, if any, were indicated as necessary by the peculiar circumstances connected with the case.

While brake gear in detail is worthy of careful attention, and the failure to receive it will in a measure affect the satisfactory operation of the brake, the principal loss that will follow poor construction has been explained to you. Finally, I do not think it will be questioned that the manner in which brakes are manipulated by employés has everything to do with the results that are obtained. Probably there are few present who have not investigated many of the alleged failures of brakes, and in one sense it is a matter of regret that it is often found to be a failure on the part of some one to perform what should be a well understood duty. If these failures were really failures of mechanism, the remedy might be readily furnished, but when it becomes a matter of the information and intelligence of employés, the problem becomes much more difficult.

UNIFORMITY IN PRACTICE.

I am of the opinion that uniform standards of construction in couplers and power brakes used upon cars involved in interchange are absolutely essential to their success. . . . The adoption of power brakes implies and demands additional training and intelligence on the part of employés directly connected with the operation of trains, and to have reasonable success in this direction it is clear that uniformity of construction is of no greater importance than uniformity of modes of operation, for failure in either case may mean disaster. Modifying existing construction should have most careful consideration before changes are actually decided upon, and the benefits to be derived should be definite and considerable, if it involves the unlearning of old things and the learning of new things by the large bodies of men whose duties cause them to have something to do with the operation of train brakes. If the methods of operation can be reduced to fixed and permanent manipulation, uniform throughout the entire country, much less trouble and chance for accident will occur than if different and unusual methods are evenly permitted to be injected into well established habits.

Recently a great deal has been accomplished by furnishing literature and by instruction to trainmen upon subjects that immediately affect their relations to the handling of brakes, and, beyond doubt, much more can be done by further effort in this direction. Upon several roads there are what is known as instruction cars, and our company also has one of these in operation. We have found it wise to make no attempt to teach employés more than they are in actual need of. Knowledge of the construction of the triple valve or of the principles upon which the automatic brake is constructed is not absolutely necessary for trainmen. Their duties are limited and well defined, and if they are made intelligent upon these points, this information is all that in most cases is desirable or possible to furnish. While I have departed somewhat from the specific object under consideration, I trust that the digression may have suggested some features that will prove to be of future interest to you.

The Handling and Distribution of Freight Cars on the West Shore.*

Mr. Wattson opened with a reference to his article published last May on this subject and continued:

But you want a system that has been successfully tried. Such is that originated by me and used for three years on the West Shore. The true test of merit is the percentage of loaded to empty car movement; the system that utilizes all the resources with the least empty movement and switching service, other things being equal, is the best.

Organization.—The best practice, and that which is fast becoming the prevailing one, is to have the distribution of cars on divisions done by the division superintendents and the distribution between divisions and connecting lines by the officer who has charge of the Car Record Office, whose title should be Superintendent of Car Service.

Operation.—All foreign cars received should have home route cards attached to either side, giving the name of the road delivering, and the station at which the delivery is made. All foreign cars moved empty when returning to the delivering road should be invariably accompanied by running slips or memorandum manifests, showing the name of the road to which delivery is to be made, in addition to the points moved from and to. Our slip (form F. R. 187) has printed upon its face—

Make this running slip from the home route card on the car, and show the road to which car is to be delivered in accordance therewith. In the absence of home route cards ask the Car Accountant for instructions.

Running slips in this form serve to designate the *route* of cars. For in tance, C., B. & Q. car 2,500 is delivered to the New York Central by the Michigan Central at Buffalo, loaded for Syracuse. When returning empty the car would be billed, "Syracuse to Buffalo. For delivery to the Michigan Central Railroad," and reported as a Michigan Central route car, and, so far as the purposes of distribution are concerned, *its identity would be changed* from a C., B. & Q. to a Michigan Central car.

All empty cars moved from one station to another for loading or other special purposes should be accompanied by special running slips. Our slip specifies what the car is to be used for, by whose order forwarded and the following:

To be used only for empty cars forwarded by special order. Destination not to be changed except by order of the officer ordering the car forward. In case car is cut out short of destination, conductor will leave this slip with car and notify Superintendent of Car Service *by telegraph*, stating cause.

All cars moving in trains billed under the ordinary running slips are subject to order for distribution, and the object of the special slip is to protect cars already ordered. It will be noticed that if a car billed specially is cut out short of destination the officer ordering it forward is to be notified of the fact, that another car may be sent forward if necessary.

When foreign cars are found at stations not having home route cards attached the agent should, after obtaining the route from the Car Record Office, fill out a home route card and attach it to the car. This is done in order that there may always be information with the car to indicate by what route it may be loaded or returned empty.

All foreign cars should be classified as to kind, capacity and route, and so reported to the superintendent's office daily by telegraph from each station, and the distribution of empties between stations for loading should be made by the superintendent with reference to the route by which cars should properly return, thus avoiding the nece sity of keeping an account of the cars by initials. Every connection of a road by which foreign cars are returned should be designated as a route. For instance, the West Shore connects with 27 different companies, and cars are received via 33 routes. All cars received from the Erie, without regard to the initials, are handled and reported as Erie route cars; and so on through the list. The West Shore handles every day cars belonging to about 150 different roads, and instead of undertaking to keep track of these by initials they are all bunched into 33 accounts or 33 routes, and the work of inventorying the cars on hand on the line each day is greatly simplified. The form of agents' report and the blank on which reports are copied in the superintendent's office as telegraphed from stations, as shown herewith, are abbreviated.

As soon as the reports from stations are complete each division superintendent should telegraph the Superintendent of Car Service a summary for all the empty cars *on hand* and *required*, classified by routes. From this report the distribution between divisions should be made. All foreign cars hauled empty in trains should also be reported to the superintendent's office according to *routes*. (See blank *A* abbreviated). This report may be made by either the conductor or the yard master at starting point, and from other stations from which a report of the cars in trains may be required.

*Paper by W. G. Wattson, read at the meeting of the American Association of Railroad Superintendents, New York City, Oct. 7, 1890; slightly condensed.

Blank A.

WEST SHORE RAILROAD.

To..... From.....1889.

Train No.....Left.....M., Engine No.....Conductor.....Engineer.....

LOADED CARS FOR		EMPTY FOREIGN CARS.		
		Kind.	Symbol.	Cars carded for
A	Hud. Riv. Div.—Local	Box	BA	Central R. R. of New Jersey.
B	Jersey City—Live Stock	Flat	BB	
C	Weehawken	Gond	BC	
D	Newburg	Ref	BF	
F	Kingston	Box	CA	Pennsylvania.
G	Albany	Flat	CB	
H	Coeyman's Junction	Gond	CC	
I	Rotterdam—Live Stock	Ref	CF	
J	Rotterdam Junction			
K	Frankfort	Box	HA	New York & New England.
KI	Refrigerator to be Iced at Frankfort	Flat	HB	
M	Utica	Gond	HC	
		Ref	HF	
Y	Total Loads	Box	KA	Fitchburg.
		Flat	KB	
EMPTY W. S. R. R. CARS.		Gond	KC	
		Ref	KF	
		Box	LA	Del. & Hud. Canal Co. via.....
		Flat	LB	"
		Gond	LC	"
		Ref	LF	"
AA	W. S., Box		Z	EMPTY CARS BILLED SPECIALLY.
AB	" Flat			
AC	" Gondola			
AF	" Refrigerator			
AH	" Hay			
AM	" Stock			
AN	Foreign Stock			
AR	Stock Cars for Albany		ZS	Total Empty Cars.

This report gives the division superintendent full information concerning the empty cars in trains and what the size of the train will be at each important station.

Advantages 1.—Every road has trouble to keep foreign cars moving in their proper routes. The diverting of foreign cars to service in which the owners have no interest or via improper routes is a practice which has done, and is now doing, more to prevent the systematic and honorable handling of cars than any other cause. The route system makes it possible to handle foreign cars properly; in fact, under its operations it is almost impossible to handle them otherwise, except it be done wilfully, as the necessary information for correct routing is always with the car. Home route cards are attached as cars are received at junction stations. Agents at all stations examine cars as soon as received to see if home route cards are attached. If not, they get route from the Car Record Office. No cars must be placed for loading that have not home route cards attached. No cars must be moved empty without running slips, and they must be made from home route cards. If a car is billed wrong the running slip locates the responsibility for the error.

2. It provides that yardmasters and conductors shall have the same information concerning the destination and route of empty as they have concerning loaded cars. This is an important factor in switching, as all cars, loaded or empty, for the same destination or route, can be bunched together when making up trains.

3. At large places, the whole train can be distributed to proper delivery tracks immediately on arrival, instead of putting the empties away on receiving tracks to be switched after proper routes have been obtained, as is customary on roads not using this system.

4. The system is sufficiently elastic to admit of the largest possible use of foreign cars for return loading consistent with fair dealing. A single illustration will make this point clear. Chicago is a common point for a large number of western roads the cars of which reach Buffalo for delivery to eastern roads via four different routes. The eastern road may have a large volume of freight for Chicago, to go via one of the four routes, and, in order to utilize all the western cars common to Chicago, no matter by what route received, agents are given a list of such roads with instructions to change running slips to the route via which the traffic is moving; or the yardmaster at any station may be given the list of roads, with instructions to change the routes of cars moving in trains, so that they will be available to meet the demands. In this way the percentage of loaded to empty car movement is kept at the lowest figure. The whole work being under the control of the Superintendent of Car Service, it is done with intelligent reference to the needs of the home road and the rights of the car owner.

5. Finally the route system provides for a complete inventory each day of all the empty cars at stations and in trains, showing the kind and where they belong. With this information the distribution can be conducted intelligently, systematically, and with the best possible results.

Blank B.—Stations.

WEST SHORE RAILROAD.

EMPTY CARS ON HAND AND REQUIRED.

ROUTE SYMBOL.		KIND OF CARS.	TELEGRAPHIC SYMBOL.		SUNDAY. On hand. Black.	SUNDAY. Required. Red.
A	Cars belonging to West Shore R.R.	Plain Box	AA			
	" " " "	Nickel Plate Line	AN			
	" " " "	West Shore Line & Hoosac Tun. Line	AW			
	" " " "	Flat	AB			
	" " " "	Gondola	AC			
	" " " "	Stock	AD			
	" " " "	Refrigerator	AF			
	" " " "	Hay	AH			
B	Cars carded for Central R.R. of N. J.	Box	BA			
		Flat	BB			
		Gondola	BC			
		Refrigerator	BF			
Y	Cars carded for Grand Trunk	Box	YA			
		Flat	YB			
		Gondola	YC			
		Refrigerator	YF			
	Total					

LOADED AND CRIPPLED CARS ON HAND.

Cars in process of loading	ZR		
Cars loaded with company's coal	ZS		
" " for this station	ZU		
" " eastbound	ZV		
" " westbound	ZW		
Cars held for repairs	ZY		

This report should be in the Telegraph Office by 4 p. m. each day, to be telegraphed to the Train Dispatcher's Office, and should include *all cars*, loaded, empty and cripples, in the yard. Enter cars on hand in column headed "Black" with pencil or black ink. Enter cars wanted for the next 24 hours in column headed "Red" with red ink. Group all empty foreign cars according to Routes, as designated by the Home Route Cards, and place the total number of each kind for the respective routes in the proper column opposite the telegraph symbols. Report loaded and crippled cars on hand without regard to kind or routes. On the call of the Dispatcher's Office for "B" report, commence at top of column headed black and send downward, prefixing the telegraphic symbol to the number of cars shown under black, for example, AA 4, AN 1, etc., continuing to bottom of report. Then give the signal "Red," and commence again at top of sheet and send down the red column in the same manner

NOTE.—This blank has seven columns like that shown, making the sheet good for a week. The dispatcher's office has blank B containing, instead of seven columns for one station, 36 columns, one for each station on the division, and the blank is filled up in one day. The total of the 36 columns is telegraphed to the Car Record office on a similar form.

TECHNICAL.

Cleveland Notes.

Radical alterations are being made at the works of the Paige Car Wheel Co., Cleveland. An addition to the old building is being made, with dimensions of 125 ft. length and 53 ft. width. This will enable the company to remove the car roofing portion of the business to the new part of the factory, and allow correspondingly more floor room for the wheel department. The present capacity of 44 wheels per day will be increased to 65 wheels per day. The company uses compressed air cranes for lifting wheels and hauling in the shop. It has also purchased the adjoining building, formerly occupied by the Avery Stamping Co.

The Niles Tool Works are now at work on special tools for the new portion of the shop. Among the interesting things to be seen at these works is a wheel with a tire worn to an average of $\frac{5}{16}$ of an inch in thickness, with no signs of a break. At the tread the thickness cannot be more than $\frac{7}{16}$. The wheel and tire have a mileage record of 804,631 miles.

The manufacturing plant of the Walker Mfg. Co., of Cleveland, is being remodeled and its capacity quadrupled. The new buildings are: Machine shop, 105 ft. wide with an average length of 350 ft. and an additional foundry 118 ft. wide by 290 ft. long. Both these buildings are of iron and brick. They have iron truss roofs supported through the centre by steel posts. These posts also carry plate girders longitudinally, upon which are to be placed traveling cranes. The machine shop roof has three gables, and in each gable will be a 25-ton traveling crane. The foundry will have two gables, each fitted up with a 25-ton traveling crane as well as several smaller ones with a capacity up to 15 tons. These cranes are designed and built by the Walker company and require for a 12-ton crane a head room of but 3 ft. 6 in., and for a 25-ton crane about 6 ft. Patent sky-lights made by Josephus Plenty, of New York, will be put in. The iron work and roof trussing is being done by the Variety Iron Works, of Cleveland. Mr. Ernest W. Naylor, mechanical and hydraulic engineer, formerly of New York, is now at work on designs for new specialties, notably heavy hydraulic shears for "scrapping" heavy boiler plate and similar work. One of these has been put into the Altoona shops of the Pennsylvania Railroad. Two large pulleys are now under construction for the American Wire Company for driving rolls. The larger has a diameter of 24 ft., with a 65-in. face, requiring a 63-in. three-ply belt, and weighing 60 tons. The smaller is 22 ft. in diameter, 47-in. face, using a 44-in. belt, and weighing 40 tons. The periphery speed of the larger is 8,300 ft. per minute. The company has sold to date 82 differential drums to cable railroads, displacing 22 solid groove drums formerly in use. It is now putting in the machinery for the elevated cable roads of Cleveland, O. Recently an 84-ton spur gear was shipped to Australia, and at present there is being made a 60-ton pulley, 24 ft. diameter, 72-in. face.

Wagner Compartment Cars.

The Shore line between New York and Boston is now running a compartment sleeping car each way nightly on trains leaving Boston and New York at midnight. There are ten staterooms in each car, inclosed with finely finished woodwork walls. There are also ten ordinary sections in each car, with elegant damask draperies and portieres upon the side next the aisle, arranged in the usual manner. Every stateroom has two seats facing each other from either side of a window; and the sections have also each two seats, of the same size and pattern with those of the staterooms. The staterooms are fitted with two sleeping berths each, an upper and a lower, and each berth will admit of but one occupant. The sections are fitted with but one berth, and this for one occupant only. There is no upper. Consequently, each car will accommodate 30 passengers with sleeping berths, every individual having a berth and a seat to himself. Each stateroom is fitted with a lavatory and hot and cold running water. The cars are lighted by the Pintsch gas system.

Steam Pipe Lagging from Waste Material.

According to the *Revue Industrielle*, some of the waste products resulting from the manufacture of paper furnish excellent material for cheap and efficient lagging for steam pipes. The waste products in question are chiefly those coming from the different cleaning and sorting machines and which are of a fibrous nature. These, when dry, are to be mixed with potter's earth in the proportion of 4 to 1, enough water being afterward added to form a plastic compound. This is spread by hand over the surfaces to be protected in thin successive layers. When dry, the coating is said to adhere firmly and is not easily broken. Its cost is practically no more than the cost of mixing and applying it.

Electric Power Transmission in Germany.

The General Electricity Company, of Berlin, and the Oerlikon Machine Works have under consideration the project of transmitting power electrically from the town of Lauffen, on the banks of the River Neckar, to Frankfort-on-the-Main, a distance of about 108 miles. About 300 H. P. of water power are available at Lauffen, and this, by means of the proposed electric transmission, is to be utilized during the electro-technical exhibition at Frankfort next year in driving the machinery, in charging electric storage batteries, for lighting and other purposes, providing that the requisite overhead copper wire line (to be about $\frac{1}{4}$ in. in diameter) will be furnished free of charge to the projectors. It is understood that the aim of the latter is to practically demonstrate to the different authorities the feasibility of electrically transmitting power over wide areas from a central station, with the view of developing additional enterprises in this line.

A New Goliath Rail.

The *Schweizerische Bauzeitung* states that the experience of the first three years of use of the original section of the Goliath rail has shown the great thickness of the rail head to be attended with some disadvantages, the inside of the metal being comparatively soft, and wearing away rapidly after the hard, outer layer has been removed. Greater breadth is, therefore, recommended in preference to depth of head, the additional advantage, it is claimed, being thereby gained of securing a greater bearing surface for the wheel tread. If Sandberg's recommendation be followed and the width of head be made 76 millimetres (3.04 in.) instead of 67 millimetres (2.68 in.), the thickness of the head, at the same time, being reduced from 47½ millimetres (1.9 in.) to 45 millimetres (1.8 in.), the bearing surface for the wheel tread would be increased from a width of 19 millimetres (0.76 in.) to 25 millimetres (1 in.). The flange width of 140 millimetres (5.6 in.) is said also to have been found insufficient.

American Mining Machinery for China.

The Ingersoll-Sergeant Rock Drill Co., of New York, shipped last week a large plant of mining machinery, comprising air compressors, rock drills, etc., to the Jehu mines in China. Mr. Jonas Crabtree, an experienced mechanical engineer, is now on his way to China to erect and operate this machinery for the company.

RAILROAD GAZETTE

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At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Superintendents' Association, whose annual meeting is reported in another column, shows marked improvement. The half-dozen gentlemen who have faithfully nursed the infant for the past few years are now gratified by an increased attendance of practical, talking men. Mr. Wattson's paper is a valuable one, and he was a forcible speaker. It deserves careful study, as Mr. Wattson's practice justifies his preaching. The subject treated by Mr. Westinghouse is, as we all know, one of the highest importance; and it is a hopeful indication when superintendents show, as these did, a lively interest in posting themselves concerning the details of their subordinates' work. With the present rapid advance in mechanical appliances superintendents will have to look out or their trainmen will become better experts than themselves in dealing with the intricate questions of skill and judgment which they (the superintendents) often have to pass upon as arbitrators. The air brake is so universally used that Mr. Westinghouse's apologetic reference to the fact that he was apparently speaking from self-interest was not needed. The other papers presented at the meeting we hope to take up in a later issue. The discussion on train rules, while informal, was of lively interest, and one of the best features of the meeting. The rules discussed require more careful treatment than we can give them in this issue, and we therefore defer the subject.

There are a good many of our readers to whom most that Mr. H. H. Westinghouse said to the Superintendents' Association about air brakes will not be new, but there are few who will not find it interesting. The simple explanation of the operation of the quick-acting triple valve and of the engineer's equalizing valve will undoubtedly be welcome to many besides the superintendents; but it is to the last part of the paper that we wish to call especial attention. We have written a good deal about the inefficiency of the average brake gear, and have called attention repeatedly to collisions which resulted from this cause. We shall claim some of the credit for the improvement in this particular that Mr. Westinghouse says has taken place in the last year; although most of the credit belongs to the Master Car-Builders' Committee, which made an admirable report on the subject at the Saratoga Convention, and to the Westinghouse Company, which is unceasing in the work of education. What Mr. Westinghouse says under the heads of "brake rigging" and "unbraked wheels" ought to be read over once a month by every railroad manager and superintendent in the country.

The Time Convention, whose meeting is reported in another column, is still in a healthy condition, and its committees are doing good work, though they do not draw out much discussion. The convention has taken a firm stand on the coupler question, and one whose influence will be valuable, though it did not require an enormous amount of firmness to take it, the convention being only a recommending body. We say the condition of the convention is healthy; but a body of this kind can hardly be regarded as overflowing with lively vigor so long as its members refrain so persistently from talking. Where committees do all the work, letter ballots are much cheaper than meetings and about as satisfactory, as far as the conduct of business is concerned. The social element is, of course, valuable aside from this. Col. Haines has in the last two meetings led off well, and it is to be hoped that his apt and vigorous addresses will loosen the tongues of some of he others.

Hard or Soft Rails.

In Dr. Dudley's paper on the wear of metals, read last Friday before the British Iron and Steel Institute, he reaffirms the conclusions reached in his famous papers published from 9 to 12 years ago. Those conclusions were that in rails mild steel is not only less liable to fracture and disintegration in the track, but it also wears more slowly under the same traffic than harder steel. Therefore his formula specified

Carbon	0.30	(0.25 to 0.35)
Manganese	0.35	(0.30 to 0.40)
Phosphorus	0.10	(or less)
Silicon	0.04	(or less)

He also specified a low tensile strength and high elongation; that is, 65,000 lbs. per sq. in., and 20 per cent. From those early conclusions Dr. Dudley has seen no reason in the experience of the last 10 years to depart. Nearly the only qualification that he now makes is to say that if a new metal could be found with a higher tensile strength, but with the same elongation, it would, from theory, wear better than the old metal. This is as near as he comes to admitting that the higher steels might possibly wear better if other things could be made equal.

Dr. Dudley anticipates that his conclusions will not be accepted by the mass of engineers and metallurgists. Indeed, we do not think that they will be. It is quite true that in the years that have passed since Dr. Dudley's paper made such a sensation and produced such an impression upon rail mill practice there has been little done in the way of stated comparative study on the lines marked out by him, but there has been a large experience with soft rails. These rails have been chemically soft (low in carbon) and physically soft (rolled with big heads and insufficiently washed). For the first, Dr. Dudley's papers are largely responsible. The conclusion reached very generally, we believe, among the rail makers and users is that rails should be made as hard as they can be without being brittle, and that this hardness is to be obtained by using a higher percentage of carbon and by improved sections and better mill practice. These last considerations, the physical ones, are now held by almost everybody to be more immediately important than the chemical ones.

In what we have to say on this subject we shall not touch the questions of sections, and of hot and cold and slow and fast working, and of the relations to each other of the various chemical elements which bother the steel makers. The physical questions have been much discussed in these columns in the last three years, not only editorially but by some of the ablest engineers, manufacturers and inspectors in the country. The chemical questions, while profoundly interesting, may profitably be let alone. We shall confine ourselves to the one question, whether or not a hard rail wears faster than a soft rail, regardless of how the hardness is produced.

The most careful studies, directed simply to this point, have been made on the continent of Europe, and especially in France. Within six months there has been published in French an elaborate paper by M. Mussy, Chief Engineer of Mines, on the different qualities of rail steel. He lays down the following fundamental conditions for a rail metal: It should give a rail of maximum stiffness and of maximum resistance to wear, without carrying these qualities to the point of producing a rail likely to break or subject to accidental deteriorations.* He then reviews various studies and discussions of the subject, beginning with that of Dr. Dudley, published in 1879.

M. Mussy points out that *all* of Dr. Dudley's rails were really soft rails. The 12 best† contained in the average carbon 0.287, manganese, 0.369; the 13 worst contained carbon 0.360, manganese, 0.521; only two of the 25 went above 0.40 carbon, and but one was as high as 0.57. It is only when the carbon is above 0.60 that rails are considered hard in French practice, while on the Southern of France the carbon is often used as high as 1 per cent. What M. Mussy says of the 25 rails considered in Dr. Dudley's first paper (1879) is equally true of the 64 rails considered in Dr. Dudley's second paper (1881); they were very soft rails.

M. Cazes, Engineer of the Southern of France, subjected Dr. Dudley's observed facts to some analysis. He found that the rail which wore best had 0 34 carbon and 0.46 manganese, while the one which wore worst had 0.22 carbon and 0.27 manganese. The difference in wear was nearly 3 to 1. Again, he divided the twelve good rails into two groups of six each, and found that the six which gave the best wear had carbon, 0.298; manganese, 0 342; the six which gave the worst wear had carbon, 0.277; manganese, 0.396. Of all impurities other than carbon, the six best had 0.463, the six worst had 0.518. He concluded that the purest rails wore best when the hardness as indicated by the carbon was equal. Of course, these were a very few examples to generalize from, and so were the 25 rails and the 64 from which Dr. Dudley established his theory. But to our mind the most important point brought out by M. Cazes is that the wear of the best of these 25 soft rails is far below what is expected of the hard rails used in France.

M. Cazes attempted to make some comparison of the wearing qualities of his 0.66 carbon rails and the 89 soft Pennsylvania rails with an average of 0.35 per cent. carbon. The differences of service were so great that the comparisons were perhaps worthless; but from comparisons of his own rails among themselves he finds that rails of 1.06 carbon wear 4.4 times as well as those of 0.55 carbon. It should be added that the manganese is very much higher in the less durable rail.

The table of 64 rails was subjected to analysis by M. Grüner, Inspector General of Mines, who decided that it was impossible to draw from it a clear conclusion as to the effect of hardness on the wear. All the rails were soft and the differences between them were merely shades of softness. The differences in chemical composition and in physical properties were often such as could be accounted for by errors in analysis or could be got by taking the test pieces from different parts of the same rail. To reason from these shades of difference to steels of decidedly different hardness "would be to pass all limits in reasoning from the particular to the general; it would be to construct a curve from one established point or from several points infinitely near." In fact, the shades of difference were so slight that several different groupings could be made from the one table which would give entirely contradictory results. The study was not made from rails of really marked difference of hardness. This is the strong point made by all of Dr. Dudley's French critics, and it was pointed out in the discussions at the time the paper was presented. The same heat could be made by different treatments, to show greater differences in its properties than were shown by Dr. Dudley's several specimens of *soft* rails.

M. Couard, engineer of the Paris, Lyons & Mediterranean Railroad, made a study of the durability of rails furnished by eight different works. The hardness of the rails was determined by physical tests—tensile strength, elongation and deflection. He found that the hardest rails of those examined had given the best service—that is, had given the longest life. This was true with regard to transverse and longitudinal fractures as well as with regard to wear. "The hard rail is best in all particulars." The chemical analyses of these rails are not given.

The same investigator compared German rails from five different works with French rails from four different works. The mean analyses were:

	Carbon.	Manganese.	Silicon.	Phosphorus.
French	0.86	0.69	0.15	0.05
German	0.31	0.33	0.08	0.09

He concludes that the French rails wore about twice as long as the German.

M. Mussy makes a careful examination of the methods of manufacture and of test employed by the great French railroads, and concludes in general that the metal should be as hard as it can be made without danger of fracture, and that this hardness is not entirely a matter of chemistry; that with the same formula great differences can be got by different manipulations in manufacture.

M. Hallopeau, Inspector of Material, Paris, Lyons & Mediterranean Railroad, concludes from extensive experiments that the best proportions of carbon and manganese are Fe, 0.40 to 0.50; Mn, 0.80 to 1.0 per cent. He says that the results of over 25 years prove that the

* Sans tomber dans un excès pouvant être l'occasion de ruptures ou détériorations accidentelles.

† Best and worst as rated by Dr. Dudley, according to wear.

rail should give by its hardness the greatest resistance to wear without brittleness. The general type of rail of the P., L. & M. is 78.6 lbs. per yard.

This briefly is the result of the examination of the field in France, where probably harder rails are used than anywhere else in the world.

Mr. J. W. Post, Engineer of the State Railroads of Holland, made very careful examinations of 16 rails to determine the quantity of metal worn away in actual service. He found accurately their chemical and physical qualities. They were from four different charges, and varied from 0.19 to 0.40 per cent. carbon. The rails having carbon 0.36 to 0.40 and a tensile strength of 65 kilogrammes per square millimetre lost 381 grammes per metre. Those having carbon 0.19 to 0.23, and a tensile strength of 50 kilogrammes pers quare millimetre, lost 485 grammes per metre; that is 27 per cent. more than the harder rail. The loss was inversely as the tensile strength and directly as the elongation.

In our own country no study so comprehensive as the collection of French observations in M. Mussy's paper has ever been made public. Setting aside the 89 rails examined and analyzed by Dr. Dudley, we can find no investigation in the last 10 years in which a considerable body of facts has been collected and put in such shape that the student can compare them. We must take the scattered testimony of individual observers, which gives their conclusions but not much of the observations from which those conclusions are drawn. Nevertheless, this testimony is valuable as showing the present drift of opinion. Mr. R. W. Hunt insists, as our readers know, upon the great importance of care in manufacture and the minor importance, *comparatively*, of the chemistry. In a recent paper he says : " My investigations of the service of thousands of tons of rails and the analyses of many hundreds of them have shown the greatest variation in the wear of rails of the same section and chemical composition." Therefore, we may conclude that he will not be strenuous for chemical hardness, but we believe that he favors increase in the hardness of rails as fast as the sections are increased. Mr. William Metcalf, who is a past master in steel working, says in his admirable paper of 1887, on the Properties of Steel, that "mild steel does not afford good resistance to abrasion. . . . Dr. Dudley's famous paper proves this, when it is interpreted properly, and subsequent experiments in Europe give, I think, without exception the result that the hardest rails show the least wear." Mr. Metcalf, like Mr. Hunt, attaches the greatest importance to the manipulation of the metal. The opinions of these gentlemen are given as representative. They might be multiplied indefinitely.

Carbon specifications or other specifications for hardness are not generally insisted upon by railroads purchasing rails, but we believe it to be a fact that the experience of the last ten years has led to a pretty general increase in carbon in American rails. The New York Central, for example, specifies now 0.50 to 0.60 per cent. carbon for 80-lb. rails. The Pennsylvania specifies 0.30 to 0.50 (instead of 0.25 to 0.35 as per Dr. Dudley's formula). The Lehigh Valley uses 0.50 to 0.55 for heavy sections, and, by the last information we had, was considering 0.60. In fact, we believe that Bethlehem steel running as high as 0.70 carbon has been tried experimentally on that road with beautiful results so far as wear goes. One engineer connected with the Bethlehem works told us that he would like to try 0.80 carbon rails if the roads would put them on good roadbeds. Probably few rail mills would, however, be willing to go to that extreme unless they could get paid for steel of great purity. Mr. Hannaford, of the Grand Trunk, writing a year ago, recommended 0.50 to 0.55 carbon for rails of 75 to 80 lbs. section. We give these as indications of the drift that we have spoken of above toward harder rails, and we believe that the most common practice of the mills now is to use 0.40 per cent. carbon and upwards. All of this does not prove that Dr. Dudley is wrong, but it indicates the teachings of experience.

Causes of Broken Piston Rods.

This subject is an old one, but fractures are ever occurring, and particularly at present, under circumstances which seem to put the matter in a new light and point to a new set of causes. However numerous may be the newly discovered reasons why a piston rod should break, there are the old fundamental causes which are always liable to exist, and which will act with the same forces as they have in the past. Of course, new designs change the conditions somewhat, but after all the general features of construction remain as before.

The elementary function of the crosshead is to guide the end of the piston rod as it emerges from the stuffing box. The piston rod itself is necessarily an unmechanical device for the work it has to perform. It is a long, slender strut of uniform section carrying a varying pressure. A correct mechanical shape would be larger at the centre than at the ends, and would also have a large fixed base with a considerable fillet, whereas the rod is straight and of uniform section to fit the stuffing box at all points of the stroke, and generally reduced in section where it fits into the crosshead, and sometimes where it fits into the piston head.

The true office of a crosshead is to guide the necessarily weakly formed piston rod in that direction which will bring the least strain upon it, rather than to guide it in any arbitrary line. The piston rod has to fit the stuffing box at all points of the stroke, and one end is fixed in position by the piston, and two fixed points determine the position of the piston rod. Hence, if a stuffing box is to be as immovable as the ordinary metallic packing makes it, and the piston head is to fit the cylinder as nearly as in common practice, the crosshead must move in the line determined by these points. If it does not so move, the continual bending of the rod caused by a conflict of the paths of motion will always, after a considerable number of strokes, result in fracture at or near the crosshead end if the rod be homogeneous and free from flaws. So also if the rod be a little crooked then the natural path of the end of the rod will be a curved line which will necessarily conflict with the straight path of the crosshead. If, on the other hand, the stuffing box be made with reasonable play, the line of travel of the crosshead may be made a straight path which in absolute direction may vary somewhat without causing a bending of the rod.

The end of the piston rod is intended to push directly on the end of the main rod, and all that intervenes in practice is the crosshead connection. If the connection at the crosshead end of the main rod were made with a ball joint, there need be no bending, and therefore no fracture of the piston rod due to bending, provided always that sufficient clearance is allowed in the stuffing box, or that the path of travel of the crosshead corresponded with the natural travel of the end of the piston rod.

The conditions of actual service are very different from the ideal. The crosshead has an arbitrary line of travel which varies materially as the engine passes over a rough roadbed. It is beyond dispute that guides which are well lined up on one piece of track may be out of line on another a few hundred feet away. Also a most important fact is the difference in alignment before and after a locomotive goes into service. If the alignment is perfect before the coal and water are put on the engine, it will be different afterward. If it is perfect before the engine is lowered down on the springs, it will be out when in a running position. Really, there seems to be no way of keeping the guides always in line with the centre of the cylinder or in any fixed position; hence, either the crosshead must be made so loose upon the guides that the piston rod can take its natural line of travel, or the stuffing boxes must be so free laterally that the piston rod has no defined natural path. Only in this way can bending be avoided, and likewise fracture, because fracture will eventually follow bending, even if the bending be extremely small, particularly with steel rods.

These statements are well borne out by long experience in locomotive building. Frequently we have seen the "crack" engine, built at a large cost to beat all previous efforts, returned with bent piston rods because of the ambition of the constructors to make the best possible fits between all working parts. The guides were found to be out of line when the engines were loaded, and the close fits between the crosshead, guides, and stuffing boxes caused the piston rods to either bend or crack.

These are not all of the old-fashioned reasons for breakages. A prolific cause is the fit of the wrist-pin boxes to the crosshead pin, and a lack of lateral play between the stub end and the sides of the crosshead. No matter how well the details of an engine are made with ordinary tools, if the main rod, crosshead and piston be coupled together upon the floor, and the keys all be driven well home, then the piston will almost always be found to be out of line with the main rod, and when bent into line the entire bending necessary to alignment when on the engine will be found to take place in the piston rod, and principally at the crosshead end. Whatever moves the back end of a main rod, whether it be a curvature of the track or lateral motion of the drivers in the boxes, the necessary bending to allow movement will take place at the joint between the crosshead and piston rod when the wrist-pin boxes are well fitted to the pin.

From this there are several important conclusions to be reached: not new ones, in fact, but perhaps presented in a new light. To prevent breaking of piston rods due to bending, the main rod at the back end, when the crosshead wrist-pin boxes are in running position, should be free to move laterally an amount equal to that compelled by service without twisting the crosshead in the least degree. This motion can be provided for by a bearing *well* and loosely fitted on the crosshead wrist without the use of a spherical bearing or other complicated device.

The stuffing box should be loosely fitted and arranged in every way practicable to allow lateral movement of the piston rod. The crosshead should have so much freedom laterally and vertically as to enable it to take the natural path determined for it by the end of the piston rod; this freedom will be small if the guides are lined up properly.

The guides ought to be aligned always after the engine has been loaded and is down upon the springs, and then again put in alignment after a few days' service. It must in truth be stated that some engines are so rigid that the change after a few days' service is immaterial; but such designs are exceptions, and all locomotives will change enough after service to take up the clearance in closely fitted rods and crossheads.

We may expect broken piston rods always, no matter how much care is taken to prevent. Nevertheless, the majority of breakages can be traced to the causes here pointed out, and it is needless to look for the causes in extraneous condition or peculiar design of crosshead or guide until the fundamental and principal origin of breaks is proved not to exist. This last statement is induced by a variety of opinions and experiences of able men regarding the same or identical designs of piston rod guiding arrangements and crosshead connections.

The Mauch Chunk Collision.

The disastrous collision of a passenger with a freight train on the Central of New Jersey near Mauch Chunk Sept. 29 is one the lessons of which should be carefully noted. The number of persons killed was three, and the other results were likewise no worse than in cases of which we hear every day, but the disaster was at best very expensive and its causes are worthy of study. Southbound passenger train No. 9 was going from Mauch Chunk to Lehighton on the northbound track to get around a stalled freight train. An order was sent to Lehighton to hold all northbound trains, but it was not properly understood and acted upon. It appears that the day operator, Frank Glosser, about 20 years old, lived in Mauch Chunk, and, in accordance with his regular custom, was intending to go home on passenger train No. 12, which stood at his station, when the order to hold northbound trains was sent to him at 7:27. The dispatcher had no sooner sent the holding order than he followed it with another one to allow train 12 to proceed, this one being received at 7:28. Glosser at once threw the first order into the waste basket, gave No. 12 leave to proceed, and boarded the train himself. After No. 12 reached Mauch Chunk No. 9 proceeded southward and met a heavy freight, which, in consequence of the blunder in orders, was allowed to follow No. 12 from Lehighton.

According to the dispatcher's testimony, the second order was to " destroy order to hold No. 12." If this was the wording, he was exceedingly careless, as he did not truly describe the previous order. At the same time the operator was guilty of gross negligence and must have been poorly disciplined. He went to the theatre that evening and has now disappeared. While sitting in his seat at the play he was informed of the collision and simply expressed satisfaction that it occurred when he was not on duty.

But the dispatcher's responsibility is grave in other directions. The company has a rule similar to the second paragraph of Rule 524 B of the Standard Code, requiring an operator to say that he has displayed a red signal before giving O K to a train order. This rule was not carried out. There was no fixed train order signal, but of course the rule that dispatchers shall get an explicit statement that red is displayed is just as important, and should be as carefully enforced when the signal is a hand lantern as when it is something else. Here we have the responsibility very clearly fixed on two individuals. From all accounts the operator must have been absolutely reckless and may take to himself all the blame ; the dispatcher omitted a plain precaution, universally recognized as a vital one, and he also may therefore take upon himself the whole blame. Besides this, he used very bad judgment in sending an order that partially superseded another without stat-

ing in the body of the message that it would have that effect. But are we to rest here? The vital question with the superintendent of a road disgraced by such a collision is, What is the likelihood of a repetition of it, and what can I do to prevent such repetition? He can do several things.

First, there was no train order signal. It is true that an ordinary red lantern or flag, if placed where the operator can keep watch of it and see that the flag is not blown down by the wind or the light extinguished, and if it is placed in a position where bystanders will not unconsciously hide it from the engineer, will generally be as effective in stopping the train as a regular fixed signal; but it needs no argument to show that the use of a fixed signal tends powerfully to promote good discipline, requiring as it does the strict maintenance of a routine. A fixed signal assures practically that the approaching engineer will always be looking for a signal.

The night operator apparently relieves the day man under circumstances which encourage a disregard of formalities. The best rules for procedure where one dispatcher relieves another provide that all pending orders shall be carefully read aloud in the presence of both, besides other safeguards. Nothing less than this is sufficient for operators at an ordinary office. Allowing the transfer to be regularly made at a time when one or both of the men is almost sure to be in a hurry invites carelessness.

The operator was plainly careless, because the first message said "all trains," and the other mentioned only one specified train. Even if he believed that he knew what the dispatcher meant, and that the phrase "all trains" really meant only No. 12, still he had not the slightest warrant for acting on such belief. It is impossible to suppose that a person making a blunder of this kind can have been well trained in his work. The operator who does not realize that every word of a train order must be carefully weighed lacks one of the first qualifications of an operator. At all events, any superintendent having operators in service whose qualifications have not been carefully tested by an expert has reason to find for himself a plain warning from this accident. By "expert" we mean an assistant superintendent, train master, chief dispatcher, or some other officer whose theory and practice are both known by the superintendent to be trustworthy.

The dispatcher could have said, "Hold all trains after No. 12." The fact that this idea did not occur to him until after he had sent the general holding order tends strongly to indicate that he was in the habit of doing his work hurriedly. Doubtless every one familiar with train wires knows dispatchers of this kind. This lapse, together with his neglect to get any positive assurance that a red signal had been displayed at Lehighton, shows almost to a certainty that this dispatcher, as well as the operator, had been allowed to deviate from strict rules without being called to account for his dereliction. We are not unmindful that many dispatchers are overworked; that they are censured more for causing delays than they are for omitting formalities; that they can generally say that their brother officers as well as their superiors are guilty of as bad practices as themselves; that their deviations from strict regulations are of a sort that any intelligent man would indulge in, and so on. But all this does not excuse the company, rather it tends to throw the responsibility more heavily on the higher authorities.

Railroads ought to adopt the Standard Code more thoroughly and intelligently. Too many officers are content with the feeling that their rules conform to the main principles of that code, without looking into details. There is too much deprecation of "literary work" and too much fear of encouraging discussions among train and station men. This code, as we have many times stated, is the result of a large amount of the very best expert work. Substantially every word in it is the result of the most careful discussion by the best railroad officers. Nothing is truer than that clear and correct thinking tends to intelligent and correct *doing*. The Uniform Code helps all who use it to think correctly, even when looked at by itself alone; when employés are encouraged to compare it with their former codes or the rules of other roads, it is still more valuable in this direction. It provides for a fixed train order signal, and if there were no other argument for the use of such a signal this raises a strong presumption that it is poor practice to do without such an appliance. The code prescribes rigid forms for orders, which it has been found profitable to *try* to conform to, even by those who still withhold entire approval. The successful way in which many roads have reduced the number of orders sent in irregular form throws upon the users of any other forms the burden of proving the wisdom of such use. Very many careful managers, in adopting the uniform code, have become firmly convinced of the necessity of more thorough examination and instruction of dispatchers as well as operators. The publication of these men's experience again throws a burden of proof upon those who fail to use its lessons.

Thus, while we have here two employés, each blameworthy and in all fairness punishable as though he were the only culprit, the important lesson for managers is that there are a variety of ways in which railroad companies can, by most simple means, prevent a large share of this sort of negligence.

The Future Seat of the Principal Iron Production of the World.

The *Manufacturer's Record* of the 27th ult. contains a long communication under the above caption from Mr. Edward Atkinson, with an appendix containing statistical matter from the last annual reports of Mr. Jeans, on the British, and Mr. Swank, on the American iron and steel trades, and a very interesting joint communication from Geo. B. Crowlam and Goldsmith B. West, mining engineers, on the mineral wealth of the Southern Appalachian region.

Mr. Atkinson says that in respect to home industry, such is the advantage of position of the people of the United States, such their productive power relative to other countries, and such their advantage in general conditions, as to have made this country the greatest consumer of iron and steel of the whole world. He quotes Mr. Abram S. Hewitt to the effect that our consumption of iron, which in 1870 to 1878 did not exceed 150 lbs. per capita, is now over 300 lbs., as against an average consumption of 175 lbs. in Great Britain, France, Germany and Belgium, and only 11 lbs. per capita for all the rest of the world. Our consumption in 1860 was less than 75 lbs. per capita.

Estimating the future demands for iron, Mr. Atkinson summarizes his conclusions as follows, for the consumption of 1890:

	Gross tons.
Present production	25,000,000
Increased consumption in the United States	7,000,000
" " " Great Britain, France, Germany, and Belgium	2,000,000
Increased consumption in all the rest of the world	6,000,000
Total increase of demand	15,000,000
Total supply required (tons)	40,000,000

This is without regard to the apparent law of accelerating demand, a continuance of which, at its present rate, would bring the demand of the world up to 50,000,000 gross tons in 1900. He gives the proportionate product of the world, disregarding fractions, as follows:

	1867. Per cent.	1878. Per cent.	1889. Per cent.
United States	14.50	16.80	30.57
Great Britain	52.80	45.20	33.16
France, Germany, and Belgium	26.00	28.75	27.98
All other countries	6.70	9.25	8.29
	100.	100.	100.

He further states that

	Gross tons.	Increase per cent.
In 1855 the product of the United States was	788,515	
" 1867 " " " "	1,305,023	65
" 1878 " " " "	2,310,215	76
" 1889 " " " "	7,603,642	238

Mr. Atkinson asks with some apprehension if this country can supply the demand; assuming that other countries cannot. England increased her make from 6,009,434 tons in 1879 to 8,493,287 in 1882 (which was about a quarter of a million tons more than her make of last year), or an increase of over 30 per cent. in production concurrently with a rise of less than five per cent. in price. During that same time we, starting from a period of depression in the iron trade which has not been equaled since 1861, and with the stimulus of a rise of 20 per cent. in price, increased our product by 68 per cent.

These figures seem conclusive that this country could easily furnish an increase of 15,000,000 tons per annum, or a gross output of 24,000,000 tons in 1900, and at a lower price than now current, if it was certain that there would be a demand for such a quantity, as the question is one of opening mines, the longest operation in commencing iron production, and building furnaces and railroads. This last, which requires the largest aggregation of capital, is imperative for the economical assembling of the materials and marketing the product, and has gone hand-in-hand with our improvements in furnace practice. Or, in other words, the question resolves itself into one of procuring capital for the necessary improvements, and we could neither furnish the full amount of the expected increased requirements, nor the 50 to 60 per cent. of them which Mr. Atkinson thinks we may be called on for, if from any adverse circumstances our production should run down as from 1883 to 1885. The successful solution of the problem requires a continuous advance.

Fully recognizing the cost of transportation in manufacturing, the *situs* of the future supply of the world's iron is located by Mr. Atkinson in the little known "Land of the Sky," or in the Southern Appalachian region. The reasons for this choice are ably set forth in the report of Messrs. Crowlam and West, before referred to. They say in effect:

The Southern Appalachian region embraces a strip of elevated mountainous country 700 miles long, with an average width of 150 miles, lying in a northeast and southwest course diagonally across a square formed by the 34th and 40th parallel north of the equator and the 77th and 87th meridians west of Greenwich, extending from the Pennsylvania line southwestwardly through Maryland, the Virginias, Kentucky, Tennessee and the Carolinas into Alabama and Georgia. It is divisible into three strips parallel with its side lines and of substantially equal areas. The northwestern strip, from Pennsylvania to Alabama, varying in width from more than 100 to less than 30 miles and averaging over 50 miles wide, is an unbroken coal field, containing upwards of 39,000 square miles, is a combination of mountain and plateau with an average elevation of 2,000 ft. above sea level, and is cut through by two streams, New River in West Virginia and the Tennessee River in Alabama.

This strip contains from 2 to 17 beds of workable coal, but slightly inclined to the horizontal, above water and containing block, splint, cannel and coking coals, and, to employ their words, "comparatively speaking, this Southern Appalachian coal field contains 40 times the amount of coal, accessible to economical production and distribution, contained in the coal field of Great Britain before a pick was struck in the ground." The country is as a whole heavily timbered and well watered, with a dry, bracing air and pleasant temperature. After mentioning some details of the ore beds, they add: "We are able to say from personal knowledge that the quantity and quality of the Bessemer ores of the Southern Appalachian region is beyond all question sufficient to meet present and prospective demand for many generations. It is a question of accessibility to the railroad lines and of the construction of railroads to permit their development, and not a question of quantity or quality. And this want of railroad transportation applies largely to the fossil and brown ore beds as well as to the magnetites." The topography is favorable to the construction and operation of both cross and main line railroads.

The region is seen to present large bodies of coal and iron ores of various kinds in close proximity, so situated topographically that the materials of iron making can be assembled at a low cost for transportation as soon as capital can be induced to furnish the necessary railroads. This will be an undertaking of some magnitude and must, as a matter of detail, precede the opening and developing of mines and furnaces. The South in general has 17.36 square miles of territory for each mile of railroad, and that part of it in which manufacturing is pursued to any extent must apparently have about a mile of railroad to each five miles of area. Taking the states which contain coal and iron, the area per mile of railroad varies from 13.25 miles in Virginia to 18.66, in West Virginia. Alabama has 16.61 square miles to each mile of railroad. It is not contended that all of the railroad indicated must be built before advancement can be made, but it is probable that some 50,000 miles must be built before that locality can compete even-handed with Pennsylvania and the manufacturing East generally.

However extreme Mr. Atkinson's predictions of our probable requirements may seem to conservative minds, there can be no doubt that he has done a service to the whole country by bringing the subject so prominently before it, and a particular service to the section indicated; for at present the high prices of Bessemer ores will furnish a powerful incentive to the development of the mountain section, the strip southwest of the valley. Whereas, if the efforts to deal with sulphur in ores, to which he refers, prove as successful as the Thomas-Gilchrist process has with phosphorus, the development of that section would probably be greatly delayed, to the ultimate loss of the whole Union, as the great concentration of capital about the present seat of iron manufacturing would powerfully retard the development of other sections.

The Federation of Railway Employés has struck a tough snag. A committee has presented to the officers of the Houston & Texas Central a statement that the fact of negroes being employed by that company "is causing many of the most worthy members of the federation to leave the service." They are compelled to associate with the negroes to a considerable extent, which they think is an injustice, as "such association is strictly antagonistic to their organization and taste." They request, therefore, that the negroes be dismissed. A meeting of the Supreme Council was called at Houston for Thursday, the 9th inst., and Grand Secretary Debs thinks that a very serious question has arisen. We cannot quite see why a railroad company should not employ negroes if it wants to, or why negroes should not work for a railroad company if they want to, or why, if they do work for a railroad company, they should not have just as much right as white men to organize for the promotion of their own interests. We venture to say that the Supreme Council will not order a strike on this issue, although they may cook up some other pretext for one.

A statement of the amount of new railroad built in the United States in the first quarter of this year is published in the last issue of the *Railway Age*. The total is given as 3,782 miles. Nine southern states have built 1,443 miles; seven southwestern states, 638 miles, and six northwestern, 644 miles. Georgia leads with 323 miles, then follow Montana, 312; North Carolina, 226; Washton, 207, and Alabama, 201. No other states have built 200 miles. The *Age* predicts from 6,100 to 6,500 or over as the year's aggregate. Comparing our own figures for

nine months of 1889 with the amount now reported, and assuming the same ratio, we should have 6,440 miles at the end of 1890. In our summary of the work of the first half of 1890 we estimated the probable railroad construc- of the year at between 6,000 and 6,600 miles.

NEW PUBLICATIONS.

The Thames River Bridge. A Report to the General Manager of the New York, Providence & Boston Railroad upon the Construction of the Thames River Bridge and its Approaches, at New London, Conn. By Alfred P. Boller, Chief Engineer. New York: 1890. For sale by the *Railroad Gazette*. Price, $5.

Oct. 10, 1889, this bridge was opened to travel, with appropriate ceremonies. It had been 16 months in building, and its opening marked an era in the history of the "Shore Line" route, one of the important lines between New York and Boston. The bridge is remarkable as having the longest draw-span in the world (503 ft., double track), as having deep and difficult foundations (131 ft. below high water) and for the beauty of its lines. The descriptions of the work heretofore published have been only very general, with no detail drawings, Mr. Boller having preferred to withhold the information until it could be given to the public in his own words and with his own drawings. The Report which now appears is a very complete and thorough monograph. It comprises 43 large pages (8 in. × 10 in.) of text, with 19 full page tables of tests of material, 13 plates showing profiles, elevation and details of superstructure, turning and locking gear and foundations. There is also a map of the location and a copy of the triangulation sheet.

Probably the method of foundation will be found the most interesting part of the report. Rocks or boulders had been found under three of the piers at depths of 100 ft., 120 ft. and 130 ft., respectively, and to these depths the foundations must be carried. The pneumatic methods were not considered practicable for the extreme depths, and open dredging was out of the question, because of the cost. Besides, there was grave question as to the integrity of the concrete deposited through water at such depths and as to the possibility of dredging to a safe bot tom through the very irregular boulders. Therefore, piles were driven from 100 ft. to 130 ft. below datum (mean low water) and cut off 45 to 60 ft. below water. Square-timbered, double-wall curbs were sunk around the piled area, 18 to 20 ft. below the bed of the river. The mud was dredged out, the piles driven and the cribs filled with sand. The outer walls of the cribs are 23 ft. deep, and they are 71 ft. square in one case and 50 ft. × 80 ft. in others, and divided into cells about 12 ft. square. On the pile heads rest timber caissons 50 ft. square and 50 ft. deep, on which the masonry piers are built up to the bridge seats, or to the turntable, as the case may be. A very interesting statement is given of the settlement of the piers, which in piers 2 and 4 (rest-piers) was $1\frac{1}{16}$ in. and 3 in., and in the pivot pier 5 in. The latter was weighted with 2,672 tons of pig iron to get this settlement.

The superstructure consists of two deck spans 150 ft. each, two through spans 310 ft., and the swing span 503 ft. The disposition of the spans is perfectly symmetrical. The trusses are, of course, pin connected. The swing span trusses are 25 ft. deep at the ends and rise to 71 ft. at the middle, by graceful lines. The floor system has some novel features well worked out. The superstructure is of steel throughout. The total cost was $1,293,940.

The appendices to the report give the specifications for all parts of the structure and numerous tables of tests of finished material. The most valuable of these tables is that of full sized eye-bar tests. Thirty-two tests are given, with full particulars of ¾-in. round tests, finished material tests and full-sized tests, in shape for easy comparison. The chemical analysis, dimensions and results of tests are given in detail.

While the information given in the monograph is minute, the text is so clear and fluent that it is easy reading.

Association of Railway Telegraph Superintendents. Proceedings of Annual Meeting.

The proceedings of the annual meeting of this association, held at Niagara Falls in June last, have been issued in pamphlet form by the Secretary, Mr. P. W. Drew, 149 La Salle street, Chicago. The pamphlet contains the papers read at the meeting, printed in full, and, in addition, some historical documents and other matter presented in connection with Mr. Robert Stewart's paper on block signals. All of these papers were considerably abridged as published in the periodical press at the time, and the pamphlet is therefore of especial value for preservation. Mr. Stewart's paper, above referred to, is particularly noteworthy, embracing as it does the only historical sketch of block signaling in this country that has ever appeared so far as we know.

TRADE CATALOGUES.

The New York Air Brake. A Preliminary Catalogue, issued by the New York Air Brake Co., 115 Broadway, New York.

This catalogue contains cuts and description of the duplex air pump, engineer's valve, and plain and quick-action triple valves recently brought out by this company. It is to be followed shortly by a more complete catalogue. The engravings show the parts of the apparatus mentioned, in section, with reference numbers and letters, and they are briefly described. A folding plate shows this brake applied to a locomotive and tender, showing reservoirs, piping and general arrangement of parts.

TECHNICAL.

Manufacturing and Business.

The Yale & Towne Manufacturing Co., whose general office and works are at Stamford, Conn., announces under date of Oct. 1 the following changes and appointments in its executive staff: Schuyler Merritt, since 1878 Secretary and since 1884 the General Manager, resigns the latter position, in order to give attention to other interests, but retains that of Secretary. He will have charge of the company's legal and patent affairs, and of the business of department B, bank locks. W. F. Donovan, since 1880 Manager of the Chicago branch and Western business, has been appointed General Manager, with headquaters in Stamford and New York. George S. Redfield, recently Manager of the tubular axle department of the National Tube Works Co., of McKeesport, Pa., has been appointed Manager of department A, locks and hardware, in the Stamford office. B. H. Warren, recently Superintendent of the works of the Hancock Inspirator Co., Boston, has been appointed to the position of Manager of Department C, cranes, etc., and D, pul e7 blocks, hoists, etc., in the Stamford office. Henry H. Suplee, recently editor of *Mechanics*, and also consulting engineer in Philadelphia, has been appointed Editing Manager in the Stamford office. W. H. Bryan, recently Secretary of the Heisler Electric Light Co., St. Louis, Mo., has been appointed to the position of Manager of the Chicago house

The removal of the Westinghouse Air Brake Co. from Allegheny City to Wilmerding, Pa., is now completed. A few days ago the last complement of workmen left for the new shops. The works are now in full operation, and, owing to the increased facilities, the output of the company is now much larger than formerly. The shops in Allegheny City are now occupied by the Fuel Gas & Manufacturing Co., another Westinghouse concern. The general offices have also been located near the new works, while the company's city office is located in the Westinghouse Building, corner of Ninth street and Penn avenue, Pittsburgh. This building is the property of the Westinghouse Air Brake Co.

The Ætna Machine Co., Warren, O., has closed a contract with the Oliver Iron & Steel Co., Pittsburgh, Pa., for an engine to drive the machinery in the new plant now building in that city.

The Harrisburg Car Manufacturing Co. suspended payment Oct. 6 and a meeting of creditors has been called for the 15th inst. at Harrisburg. This suspension rose out of the fact that the company was involved to the extent of nearly $300,000 in the failure of the Iron Car Co. of New York. It is said, however, that much of this obligation will be realized as an asset for the Harrisburg Car Co. The company claims that its assets will be sufficient for the payment of its entire indebtedness if a little time is granted.

The Brown Hoisting & Conveying Co., of Cleveland, is doubling its capacity. A brick building, 300 ft. long by 100 ft. wide, is nearly completed, and an office building of stone, 75 × 25 ft., is well under way.

The Hughes Steam Pump Co., of Cleveland, is building a new machine shop, 200 × 80 ft., and an extra building, of the same dimensions, for general purposes.

The Cleveland Frog & Crossing Co. has built a large addition to its factory. The original plant was built but two years ago and was then considered ample for some years to come.

The Bluffton Car Wheel Co. has been recently organized to build car wheel works at Bluffton, Ala.

The Lehigh Valley Spring Works Co., of Lehighton, Pa., is erecting branch works at Anniston, Ala.

The Anniston Rolling Mill, now being erected at Anniston, Ala., has just received two car loads of machinery, consisting of a muck roll, shears, rolls and other large castings, made by Lloyd, Booth & Co., of Youngstown, O.

The Central Car Supply Co., of Detroit, Mich., has been incorporated with a capital stock of $200,000.

The Cavner Railway Power Transmission Co., of Chicago, has been chartered to manufacture railroad appliances. The capital stock is $200,000; incorporators are: A. B. Cowner, Charles Kennedy, A. A. Tower.

The M. C. Bullock Manufacturing Co., of Chicago, is making extensive additions to its plant on West Lake street, including a new smith shop to be 57×69 ft., and 24×47 ft., and a foundry 100×126 ft., an erecting shop 122×126 ft., and a boiler shop 80×120 ft.

R. S. Newbold & Sons, Norristown, Pa., report the following among recent orders: Three high 18-in, puddle mill and a 42-ton squeezer for Hughes & Patterson, Philadelphia. One 25-ton squeezer and engine for Douglasville Iron Co., and two of their Cycle Rotary Shears for the Central Iron Works, Harrisburg, Pa., and the Catasauqua Manufacturing Co., of Catasauqua, Pa.

The American Foundry Co., of Tacoma, Wash., has obtained the contract to furnish all the iron and brass castings for the Pacific division of the Union Pacific road. The firm has started a foundry at Albina, Or.

Iron and Steel.

The Ashland Steel Co. has awarded contract for its steel plant at Ashland, Ky., to McIntosh, Hemphill & Co., of Pitsburgh, Pa. The capacity will be 400 tons of finished steel per day. The works will be completed by next July.

The stockholders of the Pennsylvania Steel Co. held a special meeting in Philadelphia Oct. 1, and voted to increase the capital stock from $3,000,000 to $5,000,000. The new stock will be issued to present stockholders at $150 a share, realizing $3,000,000. One-half of this sum will be devoted to paying the balance due on the Sparrow Point Works, and the remaining $1,500,000 will be used for working capital. The dividends in the last year were 18 per cent. in cash and stock. The Cambria Iron Co. will issue $1,000,000 stock, par 50, Drexel & Co. taking it at 98. The company paid 10 per cent. this year, and has a surplus of $4,000,000. The Phœnix Iron Co. issues $1,000,000 bonds to enlarge its plant.

A charter has been granted to the Boston Iron & Steel Co., of McKeesport, Pa., with a capital of $10,000. The directors are: J. R. Jackson and Horace Crosby, of Pittsburgh, and J. B. Murray and A. Chanden, of McKeesport. Work on the plant at McKeesport was commenced in September.

The two large blast furnaces of the Troy Steel & Iron Co. on Breaker Island, near Troy, N. Y., have been closed on account of the lining having burned out. It will take six months to reline them.

At the annual meeting of the stockholders of the Troy Malleable Iron Co., held recently in Troy, N. Y., the following officers were elected: William A. Grippin, President; Waldo K. Chase, Vice-President; William Sleicher, Jr., General Manager; Edwin Veghte, Secretary and Treasurer.

The Sharon Steel Casting Co., of Sharon, Pa, is making a number of improvements. A new molding room, 100×100 ft., is being added. Large purchases of machinery for the additions to the plant have been made.

The Crane Iron Company, of Catasauqua, Pa., is building an 18×85 blast furnace, equipped with fire-brick stoves. The company's old B furnace is being torn down to make room for the new plant. Frank C Roberts, of Philadelphia, the engineer of the company, is preparing the plans and specifications for the work.

The Lehigh Valley Spike Works, of Allentown, Pa., has received a contract from the Philadelphia & Reading for 100,000 lbs. of standard spikes—744 barrels.

The new rolling mill at Slatington, Pa., will begin operations soon, and about 100 employés will start the mill.

The committee appointed to investigate the Worcester (Mass.) Steel Works report the indebtedness to be $641,313, of which $55,000 is secured; total book assets, $147,947, and that for operating purposes the plant and machinery are well worth $940,000, but to be sold out piecemeal it would not realize more than $283,000, or if at auction not more than $188,700. The committee recommended that President George M. Rice and the company make an assignment or be put into insolvency.

The large plant of the Norway Steel & Iron Co. in South Boston that was was abandoned several months ago, throwing 600 men out of employment, is for sale. A syndicate of brewers has been looking over the premises with a view to purchasing. The plant is located between the Old Colony and New York & New England roads, and has an available water frontage of several hundred feet. All the machinery and material is now being sold and moved away.

The Indiana Steel Co., which was organized recently in Pittsburgh with a capital stock of $500,000, proposes to build works at Wabash, Ind., which will have a capacity of 50 tons of steel per day.

A large number of puddling furnaces are in course of erection in the Ohio Mahoning Valley. The Youngstown Iron & Steel Co. is erecting seven furnaces at its Warren rolling mill; Coleman, Shields & Co. is building two and the Falcon Iron & Nail Co. is building nine. Cartwright, McCurdy & Co. have contracted for ten double puddling furnaces, and may erect a new three-high muck train.

The Rail Market.

Steel Rails.—About 7,000 tons have been sold by eastern mills for delivery in three months. The price is said to be $30. Chicago mills quote $33.50@$34, and Pittsburgh mills $30@$31.

Old Rails.—Inquiries are numerous, more especially from the West, where there is little stock. The market at Pittsburgh is weak, and 1,500 tons of iron rails have sold at $27.75. Steel rails bring $20@$21. At Chicago old iron rails are quoted at $27, and steel rails at $18.75@$22, according to length. At New York $25.50@$26 is asked.

The Standard Thermometer Co.'s Works.

The Standard Thermometer Co., of Peabody, Mass., has recently completed important additions and improvements to its plant which will more than double its capacity. A 60 H. P. Kendall boiler has been put in and also a low pressure engine of 40 H. P., built by the Fitchburg Steam Engine Co. The numerons instruments manufactured by the company are put to a great number of uses throughout the plant To the supply pipe from the hot water well to the boiler is attached a thermometer which indicates the temperature of the water passing into the boiler. The boiler is equipped with the telemeter system, which records the pressure in the main office and also in the superintendent's office. The Spencer pressure regulator is used on the boiler, the Knowles pump being used to force water into the hot water well.

In the basement there are seven Stiles & Parker presses of various sizes and a Willett's rolling machine for rolling and cutting sheet metal. In the japanning department are three of the latest pattern ovens, where all the japanning and lacquering is done. Two elevators connect the upper floors with the basement.

On the first floor is located a large line of modern tools, consisting of grinding machinery, built by the Diamond Machine Co., of Providence, R. I.; six Flather lathes of various sizes, three Jones & Samson screw cutting machines, three Brainard milling machines, one Woodward & Rogers and two Garvin upright drills, a 24-in. square Sellers' planer, several lathes of the American Tool & Machine Co.'s make and a Barnes upright drill.

On the second floor there are 75 pieces of machinery, consisting of all classes of light lathes, saws and milling machines. On this floor the lighter parts and movements of thermometers and other intruments are made. The third floor is used for putting the parts together, setting up the instruments and testing, while the fourth floor is used for a store room, etc.

The company now has about 18,000 sq. ft. of floor space. It operates its own electric lighting plant, using an Edison dynamo, with 325 incandescent and 8 arc lamps. The arc lamps in use are made by the Electric Construction & Supply Co., of New York.

The entire building is equipped with the telemeter time system, of which this company is the sole manufacturer. Clocks are located in the basement and on each floor, which sound an alarm automatically for starting up and shutting off steam. The plant is probably the most complete of its kind in the country. Notwithstanding the additions, the works are taxed to their utmost capacity. The United States government uses

large numbers of the instruments, while the thermometers are in use upon many railroad systems.

Material Wanted.

Proposals will be received by Col. G. L. Gillespie, at the Army building, New York City, until Oct. 21, for the purchase of supplies deliverable at Sandy Hook, N. J., comprising material for building one mile of railroad track; one narrow-gauge locomotive; 12 dump cars; four dumping coal tubs; two hoisting engines; two Knowles' pressure pumps; two cubical concrete mixers; 65 pulley blocks and sheaves, and 2,000 ft. of wire hoisting rope.

Steel Tugs for the Navy Yards.

Bids were opened this week at Washington for three steel tugs for the navy. The appropriation is $35,000 for each vessel. The lowest bid was that of Harrison Loring, of Boston, who proposed to build three tugs at $32,438. John H. Dialogue, of Camden, N. J., bid $33,300 each for three tugs. Neafie & Levy, of Philadelphia, proposed to build three tugs, according to plans of their own, for $100,000, or $33,364 each. The S. L. Moore & Son's Co., of Elizabeth, N. J., proposed to deliver one tug at New York for $34,500, two tugs at $34,125, or three tugs at $34,000. James Clark & Co., of Baltimore, bid $34,500 for one tug, or $34,250 each for two tugs. The Globe Iron Works, of Cleveland, Ohio, proposed to deliver three tugs at Kittery, Me., for $34,500 each. The highest bid received was from the Pusey & Jones Co., of Wilmington, Del., who proposed to build one tug for $45,000, two tugs at $44,000 each, or three tugs at $43,000 each. These tugs will be divided among the New York, League Island and Norfolk Navy Yards. They will be built of commercial steel. The displacement will be about 192½ tons. The length will be 102 ft., extreme beam, 21 ft., and mean draft 8 ft. The triple expansion engines will have an indicated horse power of 300.

Sale of the Roach Shipyards.

The syndicate known as "Roach's Ship Building & Engineering Co., Limited," which was organized in England last June, and which made an offer to buy John Roach's ship building yards at Chester, Pa., reported their offer this week, and it has been accepted. The company has a capital of £500,000. All the shares of stock have been taken in England, except about £50,000, which will be taken in this country. The names of the Americans who will be interested are John B. Roach, President of the Delaware River Iron Ship Building & Engine Works; George E. Weed, President of the Morgan Iron Works; H. Steers, of New York, and W. Rowland, of Philadelphia. There will be seven English directors.

Measuring High Temperatures.

According to the *Chronique Industrielle*, Mr. H. Le Chatelier recently described the several methods of measuring high temperatures before the Societe d'Encouragement. After dwelling upon the Wedgewood pyrometer, which depends for its indications on the contraction of baked clay; on the air thermometer, which, though the most perfect means of temperature measurements, he considered too delicate and complicated for ordinary use; and on the methods of estimating temperatures by the appearance of the fire, he pronounced the thermo-electric pyrometer as the most exact and reliable instrument yet brought out for industrial purposes. Its principle was first outlined by Becquerel in 1832, and though not applied practically for over 50 years, the difficulties standing in the way of a commercial apparatus embodying it have now been successfully overcome.

Failure of a Suspension Bridge.

The new 300-foot suspension bridge at Victor, Cal., 50 feet above the Mojave River, gave way Sept. 27 under a test of 120 tons. The natural rock foundation under one of the corners gave way, letting the bridge, with the load, into the river. One man was slightly injured and a boy broke his leg. The bridge itself was not injured and can be raised into position at slight expense. The engineer employed by the board of supervisors had just previously stated that the bridge itself would sustain a load four times as heavy as that which caused the disaster.

The Niagara Tunnel.

Ground was broken at Niagara Falls last Saturday for the commencement of the Niagara water power tunnel, which will be built by Rogers & Clements, of New York.

Mortars and Field Gun Forgings.

Bids were opened by the Ordnance Bureau of the War Department Oct. 7 for forgings for 35 12-in. breech-loading mortars and for forgings for three experimental 2-in. rifled field guns. The Midvale Steel Co. submitted the lowest bids on both items, $3,630 per set for the mortar forgings and $435 per set for the field-gun forgings. The only other bids were from the Bethlehem Iron Works, $5,242 per set for the mortar forgings and $500 per set for the field-gun forgings. The forgings will be finished and assembled at the Watervliet arsenal. The mortars will be used in the batteries in New York and Boston harbors.

Signaling.

The Hall Signal Co. is equipping three highway crossings on the Long Island Railroad, at Jamaica, and six on the Central of New Jersey, at Bridgeton, N. J., with its automatic crossing signal.

THE SCRAP HEAP.

Notes.

The tower of the new Wisconsin Central passenger station in Chicago is to have a clock with a bell weighing 10,500 lbs.

The two men who "held up" a Missouri Pacific passenger train at Robbers' Cut, near Otterville, Mo., on Aug. 16 have been captured and are now in jail at Lexington.

Two of the express robbers who "held up" a messenger on the Cincinnati, Sandusky & Cleveland, Oct. 2, and rifled his safe, are already in jail at Bellefontaine, O., and the road's detectives are after the third, who got away with $600.

About 500 freight conductors and brakemen of the Illinois Central struck last week, demanding the reinstatement of 20 of their number who had been discharged. They asked the engineers to join them and when this request was refused they gave up and went to work.

A Chicago dispatch states that the recent opinion of the Supreme Court of Minnesota in what is known as the upper berth case effects no definite change in the situation, being merely a decision that the court to which the railroad company had appealed had no jurisdiction.

Louis Prang, of Boston, has secured a temporary injunction to prevent the further publication by the Northern Pacific of its handsome folder known as the "Romance of Wonderland," which he claims contains three or four colored pictures that are so excellent as to interfere with the sale of his copyrighted pictures. The folder in question is an illustrated story of Yellowstone Park.

The New York Central has increased the pay of engineers and firemen running large engines from 20 to 30 per cent. by advancing the mileage rates as follows: All engineers of two or more years' experience, running mogul or ten-wheel locomotives, will be paid at the rate of 4 cents a mile. All firemen firing ten-wheel locomotives will receive 2 cents a mile. This road has run engines of these classes but a comparatively short time.

Foreign Notes.

The well-known German firm of electrical engineers and contractors, Siemens & Halske, of Berlin, have completed plans for an electric street railroad for that city, and the work of building it is shortly to be commenced.

St. Petersburg reports state that of the several projected Siberian railroads the lines to Tomsk, Irkutsk, and Vladiwostok are to be commenced at the same time. The total estimated cost is at present placed at 122,000,000 roubles, to cover which the Russian treasury department has arranged for five yearly appropriations of 28,000,000 roubles.

According to the *Elektro-technische Zeitschrift*, the proper height at which electric arc lights should be placed is 0.7 of the radius of the area to be illuminated. While this rule apparently has not been followed in the larger number of installations, it is of interest to note that in more recent work there is a tendency to place the lights at greater heights.

Snow Sheds on the Central Pacific.

Officers of the Southern Pacific Co. state that precautions have been taken which it is believed will insure the regular running of trains over the Central Pacific line the coming winter, even if the snow should be as heavy as it was last season. About 9,000 ft. of additional snow fences are being built on the Salt Lake Division of the road. About a mile of the line in the Sierra Nevada Mountains, where the worst difficulty was experienced last year, has been covered with new show sheds, and about three miles of old sheds have been rebuilt. Additional rotary snow plows are to be provided and the equipment of ordinary plows and flangers increased.

The Ruling Sentiment Strong in Dea—ling with Railroad Companies.

Victim of Railroad Accident—"Doctor, do you think I can recover?" Doctor—"Certainly," Victim (eagerly)—"How much?"—*Racket*.

Discontinuing a Much-used Station.

The elevated railroad has "got square" with the people in the vicinity of Second avenue and 116th street who permit their neighbors to bring suit against the road and recover $12,000 for damages to property by the propinquity of a convenient station. Posters have been put up on the station, which read:

"Notice is hereby given that, in pursuance of judgments issued by the Superior Court of the city of New York in the suit of Peter Somers against the M. E. R. & M. R. Co., this station will be taken down and removed on or before Oct. 19, 1890."

There will now be no station in Second avenue between 111th and 120th streets. An idea of the inconvenience this action will cause is had when it is realized that this station is used by over 3,000 persons a day. The feeling against the proposed removal has culminated in a mass meeting, and a committee has been appointed to strive to prevent the company from carrying out its purpose. . . . If this fails, the Railroad Commissioners will be appealed to.—*New York Times*.

In Lieu of a Fig Leaf.

The last number of the *General Manager* contains a cartoon in which W. R. Busenbark, of the Kansas City road, is represented as standing in front of three nude figures in an art gallery, and saying: "Here is a place for my maple leaf."

New Hampshire Railroad Taxation.

The New Hampshire State Board of Equalization has completed its assessment of taxes for the current year upon the railroad companies of the state, the rate being $1.50 per each $100 of valuation.

The total railroad tax is $268,018, against $241,709 for 1889; telegraph, $2,552, against $2,570; telephone, $1,928, against $1,905; total, $272,500, against $246,186. Increase for current year, $26,314. The total railroad valuation for 1890 is $20,770,000, against $18,970,000 for 1889; increase, $1,800,000. The expense of the railroad commission is met by a tax levied upon the gross receipts of the various railroads. It is $7,395, against $7,380 in 1889.

A Station Agent Copying the Lawless Methods of Higher Officers.

The following is from a "special" in a Sunday paper, and may therefore have more than the usual percentage of "romance:"

H. C. Mills, Agent of the Elmira, Cortland & Northern, at Spencer, N. Y., was dismissed, to take effect Sept. 30. The railroad company had never secured a deed of the land on which the station building was located, and Mills, knowing this fact and that he was soon to be discharged, secured a five years' lease of the premises, and on Tuesday morning removed all the freight and express matter, locked the doors, nailed down the windows and placarded the buildings, warning all people to keep off the premises, which were now private property. These notices were signed 'H. C. Mills, lessee.' When the morning train rolled in Mills held the fort, and warned trainmen and others from the place. A notice was sent to headquarters, and on the next train came several officers of the road, who removed the trespass notices, but made no attempt to enter the depot, as Mills patrolled the premises. The officials stood guard over their property until night, when the General Superintendent and others came and attempted to enter the building. Mills pluckily confronted them, as he had the others, but the Superintendent seems to have ousted him.

The New York Central and the Knights of Labor.

The New York Central has issued the following circular, which explains itself.

"The recent strike, the acts of lawlessness committed in connection therewith, the published correspondence between the leaders of the organization that ordered it, and the fact that many men now seeking re-employment state that they quit work from fear of personal violence, and did not dare to offer to resume work for the same reason, compel the management of this company to announce that it objects to its employés being members of the organization known as the Knights of Labor. The management is satisfied that membership in this particular organization is inconsistent with faithful and efficient service to the company and is liable at any time to prevent it from properly discharging its duties to the public."

Officers intimate to the reporters that employés still belonging to the organization will be required to immediately comply with the wish expressed in the circular, or else leave the company's service. Conservative newspapers and some others (as for instance the New York *Sun*) agree that the circular is fully justified, but at the same time doubt the wisdom of the management in issuing it. Vice-President Webb is quoted as saying that the company heartily favors the other labor organizations represented among its employés.

Iron Houses for the Congo.

Last year works at Charleroi, Belgium, furnished to the Compagnie des Magasins du Congo a portable iron house which was erected at Boma, the seat of the Congo government. It consists of galvanized sheets, is two stories high, and serves the purposes of a tavern. Later on the same works supplied also an iron church and 20 small dwellings, all of which are said to have proved eminently satisfactory. Three other taverns of the same pattern are now to be furnished for different points along the line of the Congo Railroad. With the exception of the wooden stairs and cement floors, they are to consist wholly of iron. The walls are to be hollow, and will serve for ventilation. Each building will weigh about 250 tons.

Depriving Baggage Masters of Cigars.

The Boston & Albany has adopted a rule that no trunks shall be opened in the baggage room. A drummer at Worcester, last week, went to the station, as was his custom, to get a small package of samples, but the baggage master told him he could not open his trunk in the station. He produced his check and took his trunk out on the sidewalk and opened it. Then he had it put back into the baggage room and secured a claim check for it. When he wants to leave town he will have to go through a similar performance.—*Boston Advertiser*.

South Australian Railroads.

In view of the large increase in traffic over the railroad lines in South Australia, the government has decided that the construction of 350 ordinary broad-gauge wagons and 200 narrow-gauge wagons shall be put in hand. It is intended to at once call for tenders for 150 of the former and 100 of the latter. The balance of the wagons will be constructed at the government workshops. The report of the Railway Commissioners was laid before Parliament on Aug. 11, from which it seems that the profits on the earnings of the railroads for the year ended June 30 were £515,000. The working expenses were 51 per cent. on the earnings, which were 6s. 4d. per train mile.

Car Lighting.

Representatives of the Electric Gas Machine Co., of Boston, are exhibiting a sample car, lighted by their system, throughout the West.

Bids for the Hamilton Incline Road.

The directors of the Hamilton & Barton Incline Railroad have advertised for tenders for the material and work on the road at Hamilton, Ont. The work will probably be commenced about the latter part of October. The tenders call for the grading and masonry, wooden and iron trestlework and machinery necessary for constructing the line. The trestlework, either of wood or iron, will be about 400 ft. in length and of a maximum height of about 60 ft.

Chattanooga Incline Railroad.

Another incline railroad is to be built up Lookout Mountain, near Chattanooga, Tenn. The entire length of the incline will be 5,000 ft. There will be two cables of an improved pattern, with any new appliances in use in other cities. M. M. Henderson and C. S. Henry are connected with the enterprise.

LOCOMOTIVE BUILDING.

The Chicago & Grand Trunk has given an order for 10 heavy passenger engines to the Rhode Island Locomotive Works.

The Canadian Locomotive & Engine Co., of Kingston, Ont., has received a contract from the Grand Trunk for 10 mogul engines.

CAR BUILDING.

The Peninsular Car Co., of Detroit, has taken the order for 500 cars for the Western New York & Pennsylvania.

The Jacksonville Southeastern Line has contracted with the Mount Vernon, Ill., car works for 500 freight cars. One-half will be box cars and the balance coal cars.

The Toledo, St. Louis & Kansas City has placed an order for 300 box cars with the Michigan Car Company, of Detroit.

The Terre Haute Car Works are delivering box cars on a large order from the Chicago, Milwaukee & St. Paul.

The Ohio Falls Car Co., of Jeffersonville, Ind., has about finished the order of the Central of Georgia, for 35 passenger cars and four sleepers. The company is working on orders for 250 large platform cars for the Ohio & Mississippi. They are to be used in the transportation of the heavy stone from the quarries at Bedford, Ind., and have large iron trucks made expressly for the purpose. The Nashville, Chattanooga & St. Louis has contracted for 500 fruit cars and 10 passenger cars.

The Muskegon Car Co., of Muskegon, Mich., has finished an order for 50 platform and 100 box cars for the Winona & Southwestern. The works have contracts for 100 platform and 100 furniture cars for the Chicago & West Michigan and the balance of 240 of the original contract for 300 Mather stock cars, 250 box cars for the Chicago, Milwaukee & St. Paul. About 400 men are now employed at the works.

The United States Rolling Stock Co. has received an order for 100 platform cars for the Macon Construction Co. which will be built at the Anniston shops.

Two vessels loaded with railroad cars for South America cleared from Wilmington, Del., last week. One with cars from the Harlan & Hollingsworth Co., for Campana, Argentine Republic, and the other with cars from the Jackson & Sharp Co. for Brazos, Brazil.

The New York & Brooklyn Bridge has received the 12 new cable cars from the Detroit shops of the Pullman Palace Car Co., which were ordered last February.

BRIDGE BUILDING.

Atchison, Kan.—The following bids for the construction of two iron span bridges were received: King Iron Bridge Co., Weston, Mo., bridge No. 1, $1,220; Kansas City Bridge Co., Kansas City, Mo., bridge No. 2, $922.

Baltimore, Md.—The plans and specifications for the Monroe Street bridge are being drawn, and as soon as they are completed proposals for the construction will be advertised for.

The Baltimore & Potomac intends to build a bridge over its tracks at Baltimore.

Boston, Mass.—Plans have been prepared and submitted to the city council for approval for a bridge to be erected at Roxbury over the tracks of the Fitchburg, so that the present dangerous grade crossing may be abolished. The present plans provide that the entire approaches and the overhead crossing shall be about 700 ft. long. The estimated cost of the bridge, grading and surfacing, independent of land damages, is $78 142, of which $14,000 is charged to the iron work of the bridge. The bridge will be 70 ft. wide. There will be a double car track and sidewalk on each side. The board of street commissioners estimate the land damages at $108,000. Including other estimated damage, the entire cost of the change will, it is thought, amount to $436,142.

Charleston, S. C.—The Charleston & Savannah is having an iron bridge built across the Coosawhatchie River. The bridge will be about 70 ft. long. The substructure is already completed.

Charlotte, N. C.—The Charlotte, Columbia & Augusta will build a bridge over its tracks at Charlotte.

Chicago.—The city has let contracts for the following bridges: For the superstructure of the Weed street bridge, over the North Branch Canal, to the King Iron & Bridge Mfg. Co., of Cleveland, for $15,500. For the Ninety-fifth street bridge superstructure over the Calumet River, to the Chicago Forge & Bolt Co., for $11,056. For a viaduct for the Canal street bridge to A Gottlieb, of Chicago, for $11,989. For a plate girder viaduct at Washington street (the superstructure to be the present Madison street bridge, revamped), to the King Iron & Bridge Mfg. Co., for $16,685.

Dallas, Tex.—The George E. King Co. has been awarded the contract for the building of bridges over Turtle Creek, at Lemmon avenue, and Peak street, in Dallas.

Hancock, Md.—The bridge company recently organized at Hancock, Washington County, for the purpose of building a bridge across the Potomac River, has received subscriptions to its capital stock to the amount of $16,000.

Houston, Tex.—Proposals will be received by the Mayor of Houston, Tex., until Oct. 25 for building a 100-ft. iron truss bridge, with trestle approaches, across Buffalo bayou on Sabine street, in Houston.

Lockport, Ill.—The contract for the construction of the iron work of a bridge at Lockport will be awarded Oct. 6. The estimated cost of the entire structure is about $20,000. N. Whitley, civil engineer, of Joliet, Ill., has the plans.

Memphis, Tenn.—The Madison street bridge which crosses the Memphis & Charleston tracks from Madison street into Marshall avenue has been condemned.

Minneapolis, Minn.—The contract has been awarded to the Chicago Forge & Bolt Co. for the fourteen 52-in. iron plate girders to carry the railroad tracks on Fifteenth avenue, Minneapolis, Minn.

Reading, Pa.—The Penn Bridge Co., of Beaver Falls, Pa., has been awarded the contract for the iron work of the iron bridge over the Little Swatara Creek, near Frey town.

Roanoke, Va.—E. McConnell, of Rockbridge County, Va., has been awarded a contract, at $11,434, for the construction of approaches to bridges over Randolph, Henry and Park streets, in the city of Roanoke, Va.

The Roanoke Gas & Water Co. states that the contract for two bridges across the Roanoke River has been awarded to the American Bridge & Iron Co., of Roanoke.

St. Louis.—The St. Louis Bridge & Iron Co. has a contract to erect a 130-ft. single span bridge in South America.

St. Paul, Minn.—Sealed bids will be received by the Board of Public Works of St. Paul this week for constructing the superstructure of the bridge on Sixth street, from a point 150 ft. east of the east line of Kittson street to a point 110 ft. east of the east line of Commercial street.

West Bay City, Mich.—The plans for a bridge across Saginaw River are now being drawn. The estimated cost of the bridge is $41,000.

Zanesville, O.—The plans for a high bridge over the Muskingum River at Fifth street, Zanesville, has been approved by the United States Engineers.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In New York it is decided by the Court of Appeals that specific performance of a contract by a railroad company with a land-owner to erect a station at a certain point is properly denied by a court of equity, where it appears that such point is on the side of a steep mountain, in a sparsely settled district, and approached by a steep grade; that the station could only be constructed at a considerable expense; and that the public travel would be delayed by the stoppage of the trains and the public convenience would not be promoted.[1]

The Supreme Court of the United States rules that the Minnesota statute providing that any railroad company may charge for transportation "such reasonable rate as may be from time to time fixed by said corporation, or prescribed by law," and providing that no railroad company shall charge an unreasonable price for transportation or other service, do not constitute such a contract with a corporation created thereunder as deprives the legislature of its power to regulate charges made by it.[2]

In New York the Supreme Court rules that a failure to build one branch within the time limited will not work a forfeiture as to the other branches.[3]

In Virginia it is laid down by the Supreme Court of Appeals that the authority given a railroad by its charter to construct branch or lateral roads, gives it power to construct a branch line running in the same general direction as the main line. The fact that the line to be constructed will connect the main line with another road does not deprive it of its character of a branch road.[4]

Carriage of Goods and Injuries to Property.

The Supreme Court of Iowa rules that a contract by a carrier to carry goods to their destination renders the carrier liable for injury to the goods by the negligence of its connecting lines, even though such carrier is itself only a connecting line with that to which the goods were originally delivered by the shipper.[5]

The Supreme Court of Mississippi holds that the statute making a bill of lading in the hands of an innocent purchaser conclusive evidence of the receipt by the railroad company of the items mentioned therein is not retroactive, as it is not a mere rule of evidence, but changes the character and legal effect of the contract evidenced by the bill of lading.[6]

In Ohio the Supreme Court rules that an Ohio corporation engaged in carrying goods for hire as a common carrier has no right to discriminate in its freight rates in favor of one shipper, even when necessary to secure his custom, if the discriminating rate will tend to create a monopoly by excluding from their proper markets the products of the competitors of the favored shipper.[7]

In Pennsylvania the Supreme Court holds that when goods are consigned without any particular place of delivery being designated, the consignor's title passes on delivery to the carrier, and the carrier cannot, by an agreement in the bill of lading, acquire the right to hold the goods for prior freight charges against the consignor as well as for those on such goods.[8]

In Missouri it is ruled by the Supreme Court that the fact that a railroad company has already appropriated land does not affect the validity of proceedings to condemn the same subsequently instituted.[9]

In Texas, in an action for the destruction of plaintiff's house owing to defendant's alleged negligent construction of an embankment four feet high, it appeared that plaintiff's house fronted on a body of water, and that the embankment was about a mile west thereof. During a violent storm from the east, the water from the pass was blown over the house, and plaintiff alleged that the embankment prevented the water from flowing over the level country west of it; that the height of the flood was thereby increased, and the house thereby destroyed. The Supreme Court holds that, as it was clear that the injury had been occasioned by the combined action of the wind and water, and as it was questionable whether the increased depth of the water, if any, caused by the embankment, contributed in any manner to the destruction of the house, a finding that the house would have been destroyed even though the embankment had not been there would not be disturbed.[10]

The Iowa code provides that the "operating of trains upon depot grounds necessarily used by the company and public, where no fence is built, at a greater rate of speed than eight miles per hour, shall be deemed negligence, and render the company liable." The Supreme Court rules that, in order to enable the owner of stock injured beyond the limits of the depot grounds to recover, it must appear that the stock were upon the depot grounds, and, by reason of the excessive speed of the train, were driven therefrom to another portion of the track, and injured.[11]

In Georgia the Supreme Court rules that a railroad is liable for damages to crops, resulting from its tearing down a fence, though it had purchased a right of way over the land from the landlord of the owner of the crops.[12]

Injuries to Passengers, Employes and Strangers.

The Supreme Court of Indiana rules that if at the time a passenger stepped upon a railroad platform, he knew of its unsafe condition, he would not be required to abandon its use, and if he used due care proportionate to the known danger, and was injured by reason of the defect, he would not be barred from recovery by such knowledge.[13]

In Mississippi a colored man was requested to leave a car where he was seated, and go into another car, because of his boisterous conduct, but refused to go into the other car, and remained on the car platform, where he received the injuries sued for, from another passenger. The Supreme Court rules that instructions that, as the law required separate accommodations on railroad trains for white and colored people, if defendant's failure to provide such separate cars was the proximate cause of plaintiff's injuries, he could recover, were properly refused.[14]

In the Federal Court a receiver of a railroad was ordered to pay wages to an employé of the road during recovery from injuries received in the line of his duty, and without fault.[15]

In Pennsylvania the Supreme Court rules that a traveler injured at a public crossing cannot recover damages where it appears that, by turning his head at any point on the road within 100 yards of the crossing, he could command a view of the track for a distance of one-third of a mile, though on his direct examination he testifies that he stopped, looked and listened several times, but saw and heard nothing of the engine until his horse was just on the track.[16]

In Arkansas a locomotive engine was standing on the crossing, partially obstructing it, and when plaintiff's team was just in front of the engine, steam spurted out under his mules, causing them to run away, and throwing him out of the wagon. Defendant's engineer testified that he noticed the approach of the team, but paid no particular attention to it; that, on receiving a signal from a brakeman to move the engine back a little, he did so, not to exceed a foot; and that he thought plaintiff's team had crossed. The Supreme Court holds that, as there was no evidence to show that defendant's engineer was guilty of willful or conscious indifference of consequences, it was error to permit the jury to take into consideration the element of exemplary damages.[17]

[1] Conger v. New York, W. S. & B. R. Co., 23 N. E. Rep. 983.
[2] M. E. R. Co. v. State, 10 S. C. Rep. 473.
[3] People v. Broadway R. Co., 9 N. Y. S. 6.
[4] Blanton v. R. F. & P. R. Co., 10 S. E. Rep. 925.
[5] Beard v. St. L., A. & T. H. R. Co., 44 N.W. Rep. 803.
[6] Hazard v. Illinois Cent. R. Co., 7 South Rep. 280.
[7] State v. Cincinnati, W. & B. Ry Co., 23 N. E. Rep. 928.
[8] Bacharach v. Chester Freight Line, 19 Atl. Rep. 409.
[9] Corey v. Chicago, B. & K. C. Ry. Co., 13 S. W. Rep. 246.
[10] Smith v. Sabine & E. T. R. Co., 13 S. W. Rep. 165.
[11] Story v. C., M. & St. P. Ry. Co., 44 N. W. Rep. 690.
[12] Chattanooga, R. & C. R. Co. v. Brown, 10 S. E. Rep. 730.
[13] Pennsylvania Co. v. Marion, 23 N. E. Rep. 973.
[14] Royston v. Illinois Cent. R. Co., 7 South. Rep. 320.
[15] Missouri Pac. Ry. Co. v. Texas & P. Ry. Co., 41 Fed. Rep. 319.
[16] Butler v. Gettysburg & H. R. Co., 19 Atl. Rep. 37.
[17] St. Louis, I. M. & S. Ry. Co. v. Hall, 13 S. W. Rep. 138.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central of New Jersey, 1½ per cent., payable Nov. 1.
Newport & Wickford R. R. & Steamboat Co., 3 per cent.
New York Central & Hudson River, quarterly, 1 per cent., payable Oct. 15.
New York & New England, semi-annual, 3½ per cent. on the preferred stock, payable Nov. 1.
Pittsburgh, Fort Wayne & Chicago, quarterly, 1¾ per cent. on the common stock, and quarterly, 1¾ per cent. on special stock, payable in October.
Vermont & Massachusetts, 3 per cent., payable Oct. 8.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, adjourned, Birmingham, Ala., Oct. 22.
Albany, annual, Albany County Bank Building, Albany, N. Y., Oct. 13.
Alberta Railway & Coal Co., special, London, Eng., Oct. 15, to ratify the purchase of the Northwestern Coal & Navigation Company's property.
Chesapeake & Ohio, annual, Richmond, Va., Oct. 21.
Cincinnati, New Orleans & Texas Pacific, annual, Cincinnati, O., Oct. 20.
Cincinnati, Sandusky & Cleveland, annual, Sandusky, O., Oct. 17.
Cincinnati & Springfield, special, Grand Central Depot, Cincinnati, O., Oct. 29.
Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 29.
Columbus, Springfield & Cincinnati, annual, Columbus, O., Oct. 21.
Evansville & Terre Haute, annual, Evansville, Ind., Oct. 20.
Knoxville Belt, special, 126 Gay street, Knoxville, Tenn., Nov. 1.
Knoxville, Cumberland Gap & Louisville, special, 126 Gay street, Knoxville, Tenn., Nov. 1.
Knoxville Southern, special, 126 Gay street, Knoxville, Tenn., Nov. 1.
Louisville, Evansville & St. Louis Consolidated, annual, Belleville, Ill., Oct. 16.
Louisville, New Albany & Chicago, special, 47 Broadway, New York City, Oct. 29, to consider proposed extensions.
Nashville, Chattanooga & St. Louis, special, Nashville, Tenn., Oct. 29.
Nashville & Decatur, annual, Nashville, Tenn., Oct. 15.
New Orleans & Northeastern, annual, New Orleans, La., Nov. 5.
Northern Pacific, annual, Mills Building, 35 Wall street, New York City, Oct. 16.
Seattle, Lake Shore & Eastern, annual, Seattle, Wash., Oct. 16.
Western Maryland, annual, Baltimore, Md., Oct. 15.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meet-

ings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m , on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p.m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7.30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Canadian Civil Engineers.

A special meeting of the Canadian Society of Civil Engineers was held at Montreal last week for the purpose of presenting to the president, Sir Casimir Gzowshi, an address upon the occasion of his elevation to knighthood. Mr. John Kennedy presided and gave a complimentary address on Mr. Thomas Keefer and Mr Samuel Keefer, past presidents, and Sir Casimir. After replying to the address, the president handed over to the society the gold medal which was given to the late Samuel Keefer after the completion of the Niagara Suspension Bridge. Mr. Keefer's widow desired that the medal should be placed in the rooms of the society. Mr. Thomas Keefer explained that the medal was given at the Paris Exhibition of 1878 for a plan of details of the suspension bridge, the jury which awarded it being composed of engineers practically representing all the countries of the world.

PERSONAL.

—Mr. James Clark Walkely, first President of the Connecticut Valley road, died at his home in Higganum, Conn., Oct. 4, aged 74 years.

—Mr. John R. Hall died last Saturday at the age of 69 years. He was the business manager of the Eastern Express Co. from the time it was organized until 1873, when he retired from active business. He was for many years president of the Munroe Felt Paper Co., and a director in the Florida Southern road.

—Captain James E. White, Superintendent of the Sixth Division of the Railway Mail Service, with headquarters at Chicago, has been appointed General Superintendent of the Railway Mail Service, at Washington, vice J. Lowrie Bell, recently appointed Second Assistant Postmaster General. The Railway Mail Service has been placed under the supervision of the Second Assistant Postmaster General.

—Mr. T. W. Worsdell, Locomotive Superintendent Northeastern Railway Co. (England), has found it necessary, on account of the state of his health, to seek relief from the responsibilities of the office to which he was appointed in the year 1885. He will not sever his connection with the company for some time, but will continue it as an adviser in matters affecting the department. Mr. Wilson Worsdell has been appointed Locomotive Superintendent.

—Mr. F. C. Donald, recently General Passenger and Ticket Agent of the Chicago & Atlantic, has been elected Vice-Chirman of the Central Traffic Association, with jurisdiction over the passenger department. Mr. Donald has been in railroad service since October, 1883, the entire time on the Chicago & Atlantic. He has served as Northwestern Passenger Agent at St. Paul, City Passenger and Ticket Agent at Chicago, and General Passenger Agent. He was appointed to the latter position in January, 1887.

—Mr. R. N. Allen, President of the Allen Paper Car Wheel Company, died suddenly at his home in Cleveland, O., Tuesday morning, Oct. 7. The funeral services took place at Cleveland, Thursday morning and he will be buried at Springfield, Mass., to-day. Mr. Allen was in his 65th year, and seemed to be in perfect health and spirits up to within a few hours of his death. He was for many years a railroad man, having been in his early manhood a locomotive engineer on the Connecticut River Railroad. Later he was Master Mechanic on the Cleveland & Toledo, and during the war was Master Mechanic of the Memphis & Ohio (Louisville & Nashville), with headquarters at Memphis. He began his experiments with the paper car wheel in 1869 and the first wheels under his patents were made at Pittsford, Vt., in 1870. Railroads and the traveling public are indebted to Mr. Allen for much of the safety and comfort introduced into railroading with the paper wheel and steel tire. Nothwithstanding its very extensive use, Mr. Allen died leaving but a moderate fortune. His personal character was most estimable. He is spoken of by his friends as having been a sincere Christian and a man of the kindest impulses.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—H. R. Nickerson, Superintendent of the middle division at Newton, Kan., has been appointed General Superintendent of the lines east of the Missouri River to succeed C. O. Wheeler, who has resigned that office to accept the position of General Manager of the Gulf, Colorado & Santa Fe.

F. A. Burgess has resigned as Superintendent of the Eastern Division, and C. T. McLellan has been appointed to succeed him. James Collinson, Master Mechanic of the New Mexico Division, has been promoted to the position of Master Mechanic of the Chicago Division, with headquarters at Des Moines, Ia. He will be succeeded by Edward Hackett, of Denver, Col.

Birmingham & Atlantic.—This company has purchased all property of the Talladega & Coosa Valley road, and has taken charge of all its affairs. The officers of the company are: John Scott, President; D. M. Rogers, Vice-President and General Manager; W. H. Skaggs, Secretary and Treasurer; W. R. Golden, General Freight and Passenger Agent; G. A. Mattison, Master of Trains and Car Accountant, and A. F. Besson, Auditor. The general offices will be at Talladega, Ala.

Blacksburg.—The officers of this road are: President, J. F. Christian, Roanoke, Va.; Vice-President, W. E. Hubbert, Blacksburg, Va.; Secretary, W. H. Graham, Blacksburg, and Treasurer, W. B. Conway, Blacksburg.

Boston & Providence.—The following directors were elected at the annual meeting held at Boston, Mass., Oct. 8: Thomas P. I. Goddard, William R. Robeson, Joseph W. Balch, Royal C. Taft, R. H. Stevens, Roger Wolcott, and John Lowell.

Brantford, Waterloo & Lake Erie.—T. N. Warburton has resigned his position as General Freight and Passenger Agent, and M. Potticary has been appointed Acting General Freight and Passenger Agent.

Central New England & Western.—N. R. Turner, General Freight and Passenger Agent of the company, and a former Secretary of the Middle States Freight Association, has resigned, to take effect Nov. 1. C. A. Hayes has been appointed to succeed him, with headquarters at Poughkeepsie, N. Y.

Chambersburg & Gettysburg.—A notice of the incorporation of this company was published last week. The directors are: Isaac Diller, of Lancaster, Pa., President; C. D. Wood, W. H. Male, S. B. Diller, C. F. Dilley, John D. Skiles and D. C. McMullen, all of Brooklyn, N. Y.

Chicago & Alton.—H. L. Evans, Assistant Superintendent at Chicago, has resigned, and F. L. Eastman, Local Freight Agent at Chicago, will hereafter have entire charge of that business.

Chicago & Erie.—G. H. Vaillant has been appointed Freight Traffic Manager; W. C. Rinearson, General Passenger Agent, vice F. C. Donald, resigned, and E. B. Sheffer, Purchasing Agent of the company.

Chicago & Grand Trunk.—F. C. Vogel has been appointed Car Accountant of the Chicago & Grand Trunk, Toledo, Saginaw & Muskegon and the Michigan & Detroit districts of the Grand Trunk, with office at Detroit.

Columbia Railway & Navigation Co.—The trustees are: Anthony M. Cannon, Paul F. Mohr, John P. Allen, W. Byron Daniels and W. Lair Hill.

Concord & Portsmouth.—At the annual meeting of the road at Manchester, N. H., Oct. 2, the following directors were elected: J. J. Pickering and William H. Hackett, Portsmouth; Hon. Moody Currier and Walter M. Parker, Manchester; J. B. Walker, Concord; John J. Bell, Exeter, and William A. Peirce, Greenland. J. J. Pickering was re-elected President, and W. H. Hackett, Clerk.

Cumberland Valley.—At a meeting of the stockholders of the road, in Harrisburg, Pa., Oct. 6, the following directors were elected: Thomas B. Kennedy, President; George B. Roberts, J. N. Du Barry, John P. Green, Wistar Morris, A. J. Cassatt, H. H. Houston, John Stewart, W. W. Jennings, J. Herman Bossler, Edward B. Watts.

Evansville & Terre Haute.—Otto Schilling has been appointed Superintendent of Car Service, with office at Evansville, Ind.

Georgia, Carolina & Northern.—A. Riccio, Chief Engineer of the Georgia Pacific, has resigned that position to become Chief Engineer of Construction of this company, with headquarters at Greenwood, S. C.

Georgia Midland & Gulf.—The following board of directors was re-elected at the last annual meeting: A. Ilges, T. M. Foley, T. J. Pearce, J. F. Flournoy, Columbus, Ga.; C. L. Davis, Warm Springs, Ga.; J. W. Alexander, McDonough, Ga.; Seaton Grantland, Griffin, Ga.; J. E. Granniss and E. R. Lancaster, New York. The following officers were re-elected: President, J. E. Granniss; Vice-President, John F. Flournoy; Treasurer, T. C. S. Howard; and General Manager, G. Gunby Jordan.

Great Northern.—State Auditor W. W. Braden has been appointed Land Commissioner of the company.

Gulf, Colorado & Santa Fe.—C. O. Wheeler, formerly General Superintendent of the lines east of the Missouri River, of the Atchison, Topeka & Santa Fe, has been appointed General Manager of the company, to succeed J. H. Scott, resigned.

Houston & Texas Central.—Charles H. Burns, Assistant Master Mechanic of the road at Corsicanna, Tex., has been promoted to Master Mechanic, with headquarters at Houston, Tex.

Illinois Central.—The following directors were elected at the annual meeting in Chicago, Oct. 8: Oliver Harriman, George Bliss and J. W. Doane for four years, and Charles A Peabody and Norman B. Ream, for three years. They received the votes of 255,144 shares of stock out of 264,398.

Indiana, Illinois & Iowa.—John F. Durkin was recently appointed Car Accountant, with office at Kankakee, Ill., vice E. S. Papin, resigned.

Lake Erie & Western.—At the annual meeting held at Bloomington, Ill., Oct. 1, Gen. Saml. Thomas, John G. Moore, H. W. Cannon and John B. Cohrs were elected directors to fill vacancies in the board.

Long Island.—W. A. Fitch, formerly Assistant Superintendent of the road, and who resigned to take charge of the Mahoning division of the New York, Lake Erie & Western, has been re-appointed to that position, to fill the vacancy caused by the death of Assistant Superintendent W. E. Lewis.

Louisville, New Orleans & Texas.—P. R. Rogers, Assistant General Passenger Agent at Memphis, Tenn., has been promoted to General Passenger Agent, succeeding E. W. How, who has been appointed Traffic Manager.

R. F. Reynolds, Assistant General Freight Agent, in charge of passenger business at New Orleans, has been appointed Assistant General Passenger Agent in addition to his present office.

Massawippi Junction.—At a meeting of the shareholders of this new road at Stanstead, P. Que., Oct. 2, the following directors were elected: Judge Foster, S. W. Snow, H. S. Ayer, A. H. Moore, W. H. Lovell, Dr. Bachand and W. C. Webster. Judge Foster was elected President and Managing Director; W. C. Webster, Vice-President, and J. B. Daly, Secretary-Treasurer.

Minneapolis, St. Paul & Sault Ste. Marie.—C. P. Flatley has entered upon his duties as General Western Passenger Agent of the consolidated lines, with headquarters at St. Paul. Other appointments recently made are: W. B. Chandler, Traveling Passenger Agent for the territory west of Bismarck and Rugby Junction, with headquarters at St. Paul, Minn.; D. E. Clark, Traveling Passenger Agent for North and South Dakota, Southern Minnesota and Nebraska, with headquarters at St. Paul, and E. P Wilbur, Northern Passenger Agent for Wisconsin and Northern Minnesota, with headquarters at Marquette, Mich.

Mobile, Wesson & Mississippi.—The following board of directors was elected at a meeting in Wesson, Oct. 1: Dr. Luther Sexton, Dr. E. A. Rowan, William Olliver and Nathan Dale, of Wesson, Miss.; William W. Moore, J. McC. Martin and J. H. Gordon, of Port Gibson, Miss.; Herbert A. Camp, Lumberton, Miss.; J. Colin Moore, F. A. Luling, Lewis Stein, H. Austill and H. R. Crichton, of Mobile. The officers are: William Olliver, President; H. R. Crichton, Vice-President and General Manager; Luther R. Sexton, Secretary and Treasurer.

Montgomery, Pensacola & Mobile.—At a meeting of the company at Montgomery, Ala., recently, the following directors were elected: John C. Woolfolk, W. F. Joseph, J. W. Woolfolk, H. C. Davidson, Joseph Goetter, W. E. Woolfolk and E. B. Joseph, Montgomery, and John W. Woolfolk, Pensacola. The following officers were elected: President, John C. Woolfolk; Vice-President, E. B. Joseph; Secretary and Treasurer, W. C. Black.

Newport & Wickford.—The following officers were elected at the annual meeting in Newport, R. I., Oct. 6: President, George M. Miller; Secretary and Treasurer, Anthony S. Sherman; directors, George M. Miller, J. N. A. Griswold, Leroy King, David King and George P. Wetmore.

New York, Lake Erie & Western.—W. H Starr, Superintendent of the Delaware division, has been appointed Assistant Superintendent of Transportation, with headquarters at Jersey City, N. J., and W. L. Derr, Superintendent of the Jefferson division, has been appointed Superintendent of the Delaware division, to succeed him. George Van Keuren, Roadmaster of the Eastern division, has been appointed Superintendent of the Jefferson division to succeed W. L. Derr, and Frederick S. Higbid, Engineer of the Eastern division, has been appointed Roadmaster, with headquarters at Jersey City, N. J., to succeed Mr. Van Keuren.

H. C. Holabird has been appointed General Agent of the Passenger Department in charge of business south of Marion Junction, with office at Cincinnati, O. M. L. Fouts has been appointed General Agent of the Passenger Department in charge of business west of Salamanca and east of Marion Junction, with office at Cleveland, O.

B. F. Popple, formerly Eastern Passenger Agent of the Chicago & Atlantic, has been appointed Suburban Traffic Agent of the Erie, with headquarters at 317 Broadway, New York City. G. E. Fouts has been City Ticket Agent at Cleveland, O., vice M. L. Fouts, transferred. C. H. Clough has been appointed General Baggage Agent, with headquarters at the Chambers street station, New York City.

Niagara Falls & Lewiston.—The directors of this newly formed company are: John M. Brinker, Murray A. Verner, Daniel O'Day, Robert W. Jones, Charles R. Huntley, C. D. R. Stowits, Frank M. Brinker, B. L. Jones, of Buffalo, and H. S. McKee, Maurice S. Verner, J. K. Verner, Thomas McKee and William Jones, of Pittsburgh.

Ohatchie Valley.—The following board of directors was elected at Laney, Ala., Sept. 20: J. C. Laney, F E. Jackson, J. E. Line, W. A. Wilson, James A. Bilbro, Columbus Dunn and Charles N. Jelks. The board of directors elected the following officers: John C. Laney, president; Felix E. Jackson, secretary; James E. Line, secretary.

Ottawa, Arnprior & Renfrew.—The annual meeting of the share-holders of the company was held last week. The following were elected directors: Claude McLachlan and R. G. Moles, of Arnprior, Ont.; Chas. Mohr, of Mohr's Corners; W. H. Booth, Wm. Cumberland and J. R. Booth, Wm. Anderson, C. J. Smith, N. McIntosh and J. F. Booth, of Ottawa. Claude McLachlan was re-elected President and J. R. Booth Vice-President.

Peoria, Decatur & Evansville.—The annual meeting of the stockholders was held in Peoria, Ill., Oct. 7. Three new directors were elected to fill vacancies. Those elected were: D. J. Mackay, Evansville; C. C. Baldwin, New York; William A. Helman, Evansville, Ind.

Philadelphia & Reading.—Charles R. Deacon has been appointed Press Agent of the road, filling the vacany caused by the death of Horace Porter.

Richmond & Danville.—Chas. M. Crump has resigned his position as Auditor of the company.

St. Louis, Keokuk & Northwestern.—F. J. Munn has been appointed Acting Car Accountant at Keokuk, Ia., vice H. W. Pratt, resigned.

Wadena & Park Rapids.—The officers of this company now building in Minnesota are: William Crook, President; Frank C. Rice, Vice-President; J. A. Wolverton, Secretary, and Joseph Till, Chief Engineer, all of Wadena, Minn.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Alabama Mineral.—The extension has been completed from Sylacauga to Calera, Ala., a distance of 30 miles. The trains are now running through from Attala to Calera.

Blue Mountain Mineral.—Work has again been resumed on this road. It is to extend from Anniston to Jacksonville, Ala., a distance of 12 miles, and will reach many of the important mineral deposits on the line.

Briarfield, Blockton & Birmingham.—Work on the Bessemer division of the road is being rapidly pushed to completion. The grading is almost finished and the

track is being laid on both ends of the line. On the southern, or Gurnee end, where connection is made with the main line, the track has been laid to the Cahaba river, but the work has been suspended until the bridge over the river is finished. It will be completed in three weeks. Five miles of track has been laid on the Bessemer division altogether. It is expected that the entire line will be completed and in operation by Nov. 1 at the latest.

Canada Atlantic.—The company has issued $3,450,000 of first mortgage five per cent. 20 year bonds, to pay for the construction of the St. Lawrence River bridge at Coteau, Que. The net earnings of the road for the six months ending June 30, 1890, are $121,810, an increase of $14,370 over the earnings of 1889, and $35,560 in excess of five per cent. interest on the proposed issue of bonds.

Canadian Pacific.—The company has undertaken a system of permanent improvements to the road between Ottawa and Port Arthur, which it is estimated will cost over $500,000. The cribbing along this route will be replaced at once by iron work, and stone culverts will replace the present wooden ones. The line between Ottawa and Pembroke, Ont., it is stated, will also be shortened.

About seven miles of track has been laid on the extension of the Glenboro branch to Souris (Plum Creek), Man. The grading is completed for 11 miles further, and it is expected to have between 25 and 30 miles ready for operation this fall. The extension to Souris is 44 miles long. The work is light prairie grading except at the crossing of the Souris River at Millford, where there is a trestle about 3,000 ft. long and 40 ft. high, with a Howe truss bridge over the river having a 155-ft. span.

Chattanooga, Dunlap & Louisville.—This company is subsidiary to the Dunlap Iron & Railway Co., which was recently organized at Chattanooga, Tenn. It has purchased about 20,000 acres of coal and iron lands in the Sequachee Valley, near Dunlap, and proposes to build a road to the mines. O. J. Sherdar is General Manager.

Chattanooga National Park.—Two miles of the railroad line has been located, and work is to commence immediately. The line will extend from the East End junction of the Chattanooga Union railroad south to McFarland's Gap, then southeast through the gap until it reaches Battery Hill, which is the end of the right of way as now secured. The company expect to extend the road to Ringgold, Ga., by way of Snodgrass Hill and Catoosa Springs.

Chicago, Rock Island & Pacific.—The bridge across the Platte River, south of Omaha, on the line to Lincoln, will probably be completed in about a month's time. Unless unforeseen difficulties are met with, the grading will be finished, and track laid in December. Some ten miles of the tracklaying has been finished north of the Platte River. The graders are working on every section of the uncompleted grade to Havelock, Neb., near Lincoln. The entrance to the latter town will be by Twenty-seventh street.

Cleveland & Canton.—The company has completed the standard gauging of its five-mile Chagrin Falls branch, and is now running standard gauge trains from Cleveland to Chagrin Falls via Solon.

Cleveland, Wooster & Muskingum.—This company was incorporated in Ohio last week to build a road through the counties of Wayne and Medina, with terminal points at Wooster in Wayne and Lodi in Medina country. The capital stock is $300,000. The road will be about miles long. The road has been partly graded. The right of way and grade has been purchased by Ryan & McDonald, contractors on the Akron & Junction road. This firm will complete the road, and it will be operated by the Baltimore & Ohio as a branch of the Akron & Chicago Junction road.

Columbia Railway & Navigation Co.—This company was formerly called the Farmers' Railway, Navigation & Steamboat Co. Articles changing the title to the above were filed in Washington last week. The proposed road is to extend from the mouth of the Columbia River, along the north side to the mouth of the Yakima River, thence to the mouth of the Okanogan; to build a portage railroad from the Columbia River, near the mouth of the Klickitat River along the north side of the Columbia River, to a point near Columbus, Klickitat county, and to operate steamboats and other craft on the Columbia and Willamette Rivers. The capital stock is $2,000,000. The principal office is Tacoma.

Croton Valley.—Ripley & Coffin, of 50 Broadway, New York City, have the contract for building the extension of this road from Croton Landing about 25 miles southeast to the Connecticut state line.

Cumberland Gap & Mississipi Valley.—The directors have ordered the survey to begin next week between Hopkinsville, Ky., and Columbus.

Delaware & Hudson Canal Co.—The double tracking of this road commenced this summer between Saratoga and Fort Edward, N. Y., 17½ miles, is to be continued north to Whitehall, 23 miles from Fort Edward. Large shops with yards are in the course of erection at Whitehall. On the Champlain division from Whitehall to Rouse's Point additional side tracks are to be laid so that they can be utilized for second track when connected.

Delaware River & Lancaster.—The French Creek Valley branch is expected to be ready for business about Oct. 18. Only a small amount of grading, which is to connect it with the Pickering Valley branch, delays the opening of the line to Phœnixville, Pa., about 12 miles. The road begins near Phœnixville and follows the French Creek to French Creek Falls, where it diverges and runs to Lancaster. It is being built in the interest of the Philadelphia & Reading, and is to lessen the distance between Philadelphia and Lancaster. Thirty miles has been graded and the ties and rails are ready to be put down.

Duluth, South Shore & Atlantic.—A dispatch from Marquette, Mich., says that a surveying party is engaged in running a line from Cascade, eight miles west of Negaunee, Mich., to some point on the Minneapolis, St. Paul & Sault Ste. Marie road, with a view to securing an outlet at Gladstone for the Marquette iron range.

Dutchess County.—The tracklaying on this line will begin about Oct. 20, when it is expected to have most of the grading finished. At present the grading on seven or eight miles of the road has been completed. This includes the heaviest part of the work, and the contractors are not likely to meet with any obstruction to the speedy completion of the work. The heaviest grade upon the line is 52.8 per mile, and that only for a few hundred feet, and the maximum for any other portion of the road will not exceed 40 ft. The maximum curves are 5 deg. There will be only one iron bridge upon the line. It will be 300 ft. long. The contractors for the building of the road are Andrews, Warner & Co., of No. 202 Broadway, New York City. It will extend from a connection with the Poughkeepsie Bridge at Poughkeepsie, N. Y., running in a generally southeasterly direction to a connection with the New York & New England and Newburg, Dutchess & Connecticut roads at Hopewell Junction, a distance of 12 miles.

East Shore Terminal.—The belt line at Charleston, S. C., has been completed, and trains are now running from the docks of the company along the river wharves to the connections with the three roads entering the city, the South Carolina, Northeastern and Charleston & Savannah. The line is about three miles long.

Grand Trunk.—A new line about five miles long is to be built, to give a connection with the St. Clair tunnel. The new line will extend from Blackwood, on the main line between Montreal and Pt. Edward Ferry, about three miles east of the latter point, south to a point on the Sarnia branch, which reaches the tunnel. The contract for building the new line will be let very soon.

A survey is reported in progress for a line connecting the Air Line of the Grand Trunk with the Sarnia branch. The line will run from Kingscourt, five miles west of Watford, and about three miles east of Wanstead, to Glencoe, Ont., a distance of 22½ miles. This will be a straight line, with very few grades or bridges. The engineers will at once locate the line, and have it completed and ready for traffic by the time the tunnel is completed. It is expected the connecting link will be ready for traffic by May 1 next.

Huntington & Big Sandy.—Stanly & Hughs, of Ceredo, W. Va., have been awarded the contract for the grading and trestling on this road between Huntington and the Big Sandy River at a point on the state line between Kentucky and West Virginia. The line follows the Ohio River from Huntington, passing through Ceredo and Kenovee, where connection will be made with the West Virginia extension of the Norfolk & Western. The contractors have already begun work with a force of 100 men and 20 teams. The grading is light, being along the river bank, where the maximum grade will be 2 ft. per mile. The curves will not be greater than four degrees. There will be a number of trestles and two bridges. One will be 150 ft. long and the other 100 ft. long.

Kingston & Hood's Canal.—This road is being built from Kingston, Wash., southerly along the east bank of the canals to Seaback and Union City, near Olympia.

Lake Washington Belt.—The work of constructing the belt line along the shore of Lake Washington near Seattle is still being rapidly pushed. Several hundred men are at work all along the line from Black River Junction to the terminus of the Seattle, Lake Shore & Eastern. The clearing and grading is still going on, and the surveyors have located the entire line. The line between Kirkland and the terminus of the Seattle, Lake Shore and Eastern was the last section surveyed. A cargo of rails was shipped to Black River Junction last week, and tracklaying will commence in a couple of days, and the men will continue to lay the track over the section which has already been cleared and graded. The trestles between Renton and New Castle are being built.

Lehigh & Hudson River.—Patrick O'Hehir, of New York, has been awarded the contract for building a line for this company between Hamburgh and Franklin, N. J., about two miles. The company has been using the track of the New York, Susquehanna & Western between these points.

Macon & Atlantic.—The preliminary surveying corps of the company, under charge of Capt. T. P. Stanley, has been transferred to Macon, Ga., and the locating party is making the survey from the Ogeechee River, west of Guyton, to Savannah.

Manistee & Grand Rapids.—The track has been laid on about 7⅝ miles of this road near Manistee, Mich. This work is not now in progress, but will be resumed shortly. It has been delayed by right of way difficulties. Fourteen miles of the road has been graded and the location has been finished on 27 miles of the 110 between Manistee and Grand Rapids. The location of the road at Manistee is very circuitous, but the difficult work made a more direct line impossible, without a very large expenditure. For several weeks the construction engine has been taking out cars of lumber from the mills at Filer City, in the southern part of the city, but no regular trains are yet being run.

Manitoba & Northwestern.—Tracklaying was commenced last week on the extension of this road from Saltcoats to Yorkton, Man., about 17 miles, which was graded this year.

Marietta & North Georgia.—The surveying of the branch road of the Knoxville Southern division from near Athens, Tenn., to the Starr's Mountain iron mines is being pushed rapidly, and it is thought the line will be finished and ready for business by Jan. 1. The road will probably be operated by this company.

Mexican Northern.—Construction is going forward rapidly, the grading having progressed some 25 miles. Rails sufficient for 48 miles have arrived. Two locomotives for the line have reached Piedras Negras.

Mineral Belt.—This road is projected to extend from Llano, Tex., to Horse Mot, five miles west, thence north and around through the iron and manganese districts, a total distance of about 25 miles.

Mobile, Wesson & Mississippi.—This company was organized at Wesson, Miss., Oct. 1 It is formed by the consolidation of the Mobile & Mississippi, Port Royal & Mexican Gulf, and other roads which proposed to build through Southern Mississippi and which had not done much besides proposing.

Montgomery, Tuskaloosa & Memphis.—The work of grading the road is progressing rapidly and the greater part of this work between Montgomery and Tuskaloosa, Ala., is nearly completed. Brown & Co., who have the contract for the construction of the road, have let the contract for the bridge to be built over the Alabama River, near Montgomery, to the Phœnix Bridge Co. The material for the bridge is about ready at the company's works, and will be shipped soon. The road from Montgomery to the river is already graded and it is believed that the track will be laid within 30 days, to enable the bridge contractors to deliver the bridge material at the river. The contractors are distributing near the line of road the rails for track laying, and this work will be commenced at an early date.

Nashville, Chattanooga & Tennessee.—The work on the Pikeville extension is progressing, and has now been completed for 11 miles above Dunlap, opposite what is known as the Owen's Place, Tenn. It will be completed about Jan. 1.

New Roads.—C. W. Leavitt, of New York City, has the contract for building the proposed road from Caldwell to Great Notch, N. J., on the New York & Greenwood Lake road. About $65,000 has been subscribed to build the line.

New York & New England.—Two routes are being surveyed for the proposed connection with the Providence & Springfield, now a division of this road. One line is from Woonsocket, R. I., southwesterly to Primrose, and the second is from East Thompson, Conn., southeast to Pascoag, R. I., the northern terminus of the Providence & Springfield. There is little difference in the length of these roads, both being about five miles long.

Niagara Falls & Lewiston.—Articles of incorporation were filed with the Secretary of State at Albany, N. Y., Oct. 8, to build a road about seven miles long from the easterly shore of the Niagara River, near Lewiston, to the village of Niagara Falls. The capital stock is $100,000.

Northern Pacific.—On the Mullan extension, from Missoula, Mont., to Mullan, Idaho, the track has been laid to Pottsville, within a few miles of the summit of the Bitter Root Mountains, through which a tunnel is to be built. The company has commenced to lay track on the branch north from Mullan to Burke, Idaho.

Ottawa & Gatineau Valley.—The rails are now laid to Ironsides, Que., and the road has been graded to La Pache, about 30 miles north of Chelsea. Construction trains will run to Chelsea next week. The road connects with the Canadian Pacific at Hull, opposite Ottawa.

Pachuca & Tampico.—Pichard Honey is hurrying the grading on this line, the principal force being on the Llanos de Tulancingo at present, where the roadbed is being constructed at the rate of one kilometre a day. Work is also going forward on the northern end at Zacualtipam. George Brinkman is in charge of the construction and has a large force of men at work.

Paducah, Tennessee & Alabama.—The company is now operating freight and passenger trains on the first 50 miles of the road, recently completed. This is from Paducah to Kensee, a new town on the Kentucky and Tennessee state line. The work is in progress beyond Kensee to Paris, 17 miles further south, where a connection is made with the Louisville & Nashville. The grading has been practically finished to Littleton, eight miles from Paris, and work has been commenced at the latter point toward Littleton.

Perry County.—The company is receiving liberal aid from the farmers and merchants all along the proposed route of the extension from New Bloomfield to Loysville, and Landisburg, Pa., by way of Elliottsburg and Green Park, and it is believed that the line will be placed under contract this fall.

Peru & Detroit.—The crossing of the Lake Erie & Western tracks east of Peru, Ind., was completed last week. The remaining portion of the uncompleted track, about two miles, near Chili, will be finished this week. Gravel trains have been ballasting the past two weeks, and trains will be running within the next ten days. The road has been built with substantial masonry, culverts, iron bridges and heavy rails. From Peru east it parallels the main line of the Wabash two and one-half miles, and thence runs north through the hills, avoiding the otherwise heavy grades into Chili, nine miles distant, where the main Detroit line is reached.

Philadelphia & Reading.—The company has nearly completed the work on the New Hope extension of the Northeast Pennsylvania road. The stone work on the various bridges is about finished, the grading done, and the tracks are ready for laying the rails. There will be 10 stations on the line. Of the several bridges, the most important will be that crossing the Neshaminy, near Kirkwood, which consists of several spans of 75 ft. each. The new line will shorten the distance from Lambertville, which is on the opposite side of the Delaware River from New Hope to Philadelphia, about 15 miles. The road will be well ballasted and laid with 70-lb. rails.

Port Arthur, Duluth & Western.—Work is being pushed rapidly ahead on this road. The rails, for the first section above the Kaministiquia River, up to the Beaver, have arrived from the American mills. The next ten miles of grade is just ready. The first consignment of English rails has arrived at Montreal, and the whole of the 50 miles is covered with men, so that there is no doubt but that the track will be laid through to the end of the 50 miles, at or near Sand Lake, this fall. The Ontario government has inspected the second ten miles and the representative for the Dominion Government inspected the road to Stanley.

Portland & Fairview.—This company has been incorporated in Oregon by O. V. Monroe, A. W. Lambert and James D. Hart. The capital of the corporation is $50,000. The office is at Portland.

Port Townsend Southern.—About four miles of track has been graded north from Olympia in the direction of Union City, Wash., at the end of Hood's Canal The company will connect by boat with Quillicene, a the north end of Hood's Canal, the southern terminu of the line from Port Townsend. The company propose to complete the road from Olympia to Port Townsend via Hood's Canal. by Dec. 31. 1891. The distance is 11 miles. The locating engineer has just finished th survey along Hood's Canal to Union City. Trains are now running on regular schedule between Port Townsend and Crocker's Lake, which is five miles from Port Discovery and ten miles from Quillicene. Work on the remainder of the line is being pushed very rapidly, and the right of way between Crocker's Lake and Quillicene has been definitely located and secured. Between Union City and Tenino, the northern terminus of the Olympia & Tenino branch, a few right of way cases have not yet been adjusted.

Qu'Appelle, Long Lake & Saskatchewan.—The Canadian Pacific is now operating the entire length of this road from Regina, on its own line northerly to Prince Albert, in Saskatchewan, a distance of 200 miles. More than half of this track has been laid since Jan. 1. The principal intermediate station is Saskatoon, about 180 miles from Regina.

Richmond, Petersburg & Potomac.—The Belt Line Railroad, connecting the North and South lines around Richmond, Va., over the James River, by a long bridge, has been completed. The road was built by the Richmond & Petersburg and the Richmond, Fredericksburg & Potomac.

Roanoke & Southern.—The grading forces finished on Sept. 30 all the work in North Carolina, which completes it to Martinsville, Va., 61 miles north from Winston-Salem. The track is completed to Mayo River, the bridge over which is being erected by the Youngstown Bridge Works. The material is on the ground for laying track to Martinsville, except that for the bridge over Smith River, 3¼ miles south of there, which will be shipped by the Edge Moor works as soon as the track is ready. North of Martinsville the line is under contract for 30 miles, and work is progressing satisfactorily. Thirteen miles south from Roanoke has been finally located and that section is ready to let to contract. The gap of 14 miles between the two is being located now. The extension south from Winston-Salem, is now to be taken up with a view of final location.

The traffic on that portion of the line in operation (Winston-Salem, to Madison, N. C., 32 miles) shows a very steady increase, and has from the date of opening more than paid the operating expenses.

Rome, Watertown & Ogdensburg.—It is proposed to form a local company to build a branch road from Woodard station, on the Syracuse Division, to South Bay, N. Y., on Oneida Lake. The new branch will be 5½ miles long. The company has agreed to build and operate it if the people along the proposed line will donate the right of way and the necessary frontage lands on the lake. The surveys have been made and a good route found. The principal traffic will be the excursion travel to the lake in summer and the transportation of ice.

South Bound.—Nearly one-half of the grading has been completed between the junction of the road with the Central of Georgia, near Savannah, and the Savannah river at the bridge site. This grading is not continuous. A large supply of rails has been distributed and tracklaying will soon be resumed. Not only have the rains materially interfered with the progress of construction, but sub contractors have been embarrassed by the scarcity of labor. None of them has been able to secure as many hands as desired; and this has prevented work from progressing as rapidly as anticipated. Right of way is being cut on the South Carolina side of the Savannah river. The foundation for the bridge over the Savannah river has begun, and with a cessation of rains the work will progress much more favorably than it has during the past three weeks.

South Georgia & Florida.—A construction company, called the Chicago Continental Construction Co., is reported to have been organized in Chicago within the last few weeks, which has undertaken to build this road between Tampa, Fla., and Albany, Ga., about 250 miles. The survey will begin shortly.

Thomasville & Southern.—Notice has been filed that an application for a charter will be made for this road. The projected line is to extend from Thomasville to some point on the Florida line and to connect with a road from Tallahassee. The incorporators are: R. L. Bennett, J. S. Montgomery, J. W. Reid, C. P. Hansell and W. E. Davies, who are the directors of the Tallahassee & Northern, of which the above line is the Georgia Division.

Ticonderoga.—The grading is about finished on this short road which is being built from Ticonderoga, N. Y., to connect with the railroad lines of the Delaware & Hudson Canal Co. About 100 men are now at work and the road will be opened this fall. It is all in the city of Ticonderoga and connects the mills at the outlet of Lake George with the Delaware & Hudson Canal Co's. line. It is about two and a quarter miles long. Maurice Dower, of Ballston, N. Y., is the contractor. C. H. DeLano of Ticonderoga, is President.

Toledo, Findlay & Springfield.—This road is said to have been purchased by the Cincinnati, Hamilton & Dayton. If the report is correct, the company will probably operate it as part of its Bowling Green Division, which now extends from Toledo to Bowling Green, O., 20 miles. The new road was built last year from the latter point to North Baltimore, 35 miles.

Trenton Cut-Off.—The grading from Morrisville to a point near the Schuylkill River will be completed by Jan. 1, but it is not thought that tracklaying will begin before spring, unless the winter should be mild. The roadbed will be stone ballasted and 85-lb. rails will be laid on white oak ties. The grades will be very light, the maximum grade ascending going east being 26 ft. to the mile, and descending going east about 30 ft. No curve will exceed a mile radius, and the most of them will have a two-mile radius. The contractors are at work on the different bridges along the line. The stone structure across the Neshaminy Creek will be completed this month. The bridge will consist of eight arches 50 ft. in length. The bridge across the Wissahickon creek at Flourtown will be finished about the middle of November. It will have seven spans of 50 ft. each and three spans of 30 ft. The bridge across the Schuylkill River will consist of seven spans of 125 ft. each. It will cross the Pennsylvania Schuylkill Valley Railroad, the Philadelphia & Reading's Norristown Branch and the main line of the Reading road. The road connects with the New York division at Morrisville, Bucks County, and the western terminus is at Glen Loch, Pa., on the main line, a distance of 46 miles. The road will be opened next July.

Union Pacific.—The last standard gauge rail on the Utah & Northern was laid Oct. 1, making the entire line between Salt Lake and Butte, Mont., 452 miles, standard gauge. About 150 miles between Ogden and Pocatello have been changed. Part of the line has been entirely relocated and a branch will be built to reach those towns which were reached by the old line, but are not on the present road. The reconstruction began in February. Tracklaying has begun on the Pioche extension from Milford, Utah, south, with a tracklaying machine, and the work is progressing at the rate of 1½ miles daily.

Utah Central.—A two mile extension is to be built up Red Butte cañon from the present terminus to Sandstone quarries. J. Fewson Smith is Chief Engineer.

Wadena & Park Rapids.—The contractors have about 200 men at work on this road between Wadena and Park Rapids, Minn., and they are increasing the force daily. They commenced work Sept. 1. David Swank and John Vogelberg, of St. Paul, are the principal contractors. Tracklaying is to be commenced next spring, and the road will be in operation by Aug. 1, 1891. The grading averages 16,000 cu. yds. per mile. The maximum grades are 31½ ft. per mile, and the maximum curves are 2½ degrees. The only bridges are four short spans, 44 ft. long, over pine logging streams, branches of the Crow Wing River, which empties into the Mississippi River. The road commences at Wadena, Wadena County, and terminates at Park Rapids, Hubbard County, passing through Leaf River, Rockwood, Red Eye and Blueberry Townships, in Wadena County, and through Straight River and Todd Townships in Hubbard County. The distance is 36 miles.

Watauga Valley.—The contract will be let in a few days for building this road from South Watauga, near Johnson City, Tenn., to Watauga Point, on the East Tennessee & Western North Carolina.

Wichita Valley.—Trains are now running between Wichita Falls and Seymour, Tex., a distance of 52 miles, all of which has been built this year. The road is a branch of the Union Pacific, Denver & Gulf.

Zanesville, Mt. Vernon & Marion.—Upon application of Cary W. Kauke, President of the road. A. A. Speer has been appointed receiver. The company has issued $225,000 in bonds and expended the money in constructing a belt line around Zanesville, O., for which Chase Andrews and Frank N. Wedge were contractors. It is now in default $42,000 interest, and has outstanding obligations amounting to $10,000 more. Suit is entered against Wedge, and the Court is asked to annul the contract.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The Atlantic & Pacific has sold 314,668 acres of timber land on the line of its road at $2 per acre. Large lumber plants will be at once erected by the purchasers to work up the product for shipment, and the traffic on the long hauls is expected to largely increase the earnings.

Birmingham & Atlantic.—The Talladega & Coosa Valley road, extending from Pell City, on the Georgia Pacific, to Talladega, Ala., a distance of 25 miles, has, with its equipment, been sold to a new company, the Birmingham & Atlantic.

Cedar Falls & Minnesota.—In the case of Morris K. Jesup against the Illinois Central, Dubuque & Sioux City and Cedar Falls & Minnesota companies, under a bill filed in the United States Circuit Court, an opinion was handed down by Justice Harlan, of the Supreme Court, at Chicago, Oct. 6, holding that, while the Illinois Central was not liable for the rent, the lease between the Dubuque & Sioux City and the Cedar Falls Company was a good and valid one, and that under it the Dubuque road was liable to Morris K. Jesup, Trustee for the bondholders of the Cedar Falls road, for the accrued rent now due, which has been deposited with the court, amounting to over $300,000. The court in this opinion holds that there was no fraud in the making of the lease. This case was argued last June for nearly a week before Justice Harlan and Judge Blodgett, who concurs in the opinion.

Grand Trunk.—This company has issued £1,200,000 sterling of perpetual four per cent. debentures at 97½ per cent. The stock will be used to redeem the balance of the Great Western six per cent. bonds and to meet the outlay on the St. Clair tunnel.

Houston & Texas Central.—The suit brought by M. Gernsheim & Co., to have the reorganization scheme declared void and to enjoin the Central Trust Co. from imposing the new assessment of $71.40 per share of $100, has been decided against them in the Supreme Court, at New York City. The judge this week rendered his decision denying the application for an injunction. The original assessment of $73 was held to be illegal, and this second assessment was made on July 17 last.

Kanawha & Michigan.—Judge S. Burke, President of the Toledo & Ohio Central, and other officers of the road have purchased a large amount of the stock of the above company and it has been arranged to operate them very closely, practically as one line between Toledo, O., and Charleston, W. Va., 310 miles, the former is 184 miles long and the latter 126 miles, the connection being at Corning, O. It is not true that a controlling part of the stock has been purchased, however, and no lease or sale has been made, nor is such action contemplated.

Illinois Central.—At the annual meeting in Chicago, Oct. 8, the stockholders voted to authorize the increase of the capital stock from $40,000,000 to $45,000,000 by a vote of 255,144 shares out of 264,398 represented.

International & Great Northern.—The foreclosure suits, which have been pending in the Texas State Court at Tyler, Tex., for nearly two years, have just come to a sudden conclusion by the withdrawal of both the suits by the trustees. Herbert B. Turner, of New York, for the Farmers' Loan & Trust Co., and Thomas G. Sherman, of New York, for Messrs. Kennedy & Sloan, trustees, after an eight-days' trial at this term of court, dismissed their bill on Tuesday last. The conclusion of these suits in this way postpones the reorganization, and is regarded as a substantial victory for the Missouri, Kansas & Texas interests.

Lehigh & Hudson River.—A mortgage for $3,000,000 in favor of the Farmers' Loan & Trust Co. of New York has been filed in New Jersey and New York. The bonds secured by the mortgage are to be issued to cancel maturing bonds and other indebtedness, and to pay for the completion of the bridge at Phillipsburg, N. J., the extensive work between Franklin and Hamburg, and for other improvements that are now under way.

Pittsburgh & Lake Erie.—The McKeesport & Belle Vernon Company was this week merged into the Pittsburgh, McKeesport & Youghiogheny, a part of the Pittsburgh & Lake Erie, which purchased the road in January, and since then has been operating it.

St. Louis, Alton & Terre Haute.—The stockholders of the company met in St. Louis Oct. 3 and ratified the sale of the line from East St. Louis to Terre Haute to the Cairo, Vincennes & Chicago, which is controlled by the Cleveland, Cincinnati, Chicago & St. Louis, to whom the purchase will be turned over, the laws of the State of Illinois making invalid the purchase of a road in the state by a company incorporated outside Illinois. Out of a total of 47,684 shares there were cast in favor of the sale 35,760 votes, 7,000 more than the requisite two-thirds.

St. Louis & Chicago.—In the United States Court, at Springfield, Ill., Judge Gresham has confirmed the report of Master Commissioner Bluford Wilson, filed March 31, in the case of the American Loan & Trust Co. of New York against the railroad and others. A decree was also entered declaring that the holders of 200 bonds numbering from 1,401 to 1,600, inclusive, given by the railroad and bearing the date of April 1, 1887, shall not be entitled to share in the distribution of the fund raised from the sale of the mortgaged property. The principal holders of the bonds have taken an appeal from Judge Gresham's decision.

St. Louis Merchants' Bridge Terminal Railway Co.—At a meeting of the stockholders, held in St. Louis Oct. 2, it was voted to increase both the capital stock and the bonded indebtedness of the company from $2,000,000 to $3,500,000.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Oct. 8, 1890.

The Rock Island has given notice, through the Trans-Missouri Freight Association, of its intention to put in effect the reduced rates on grain ordered by the Commission from points west of the Missouri River on Oct. 17. It is not probable that the other lines will put in the rates west of the river, except so far as may be necessary to meet the competition of the Rock Island.

The Trans-Missouri Freight Association held its regular meeting at Kansas City yesterday. The most important subject under consideration related to the future of the association, whether a new chairman should be elected to succeed Chairman Finley, or whether the association should be amalgamated with the Western Freight Association. It was finally decided to continue the organization as at present in charge of the Chief Clerk until the managers meet in this city, Oct. 15.

Chairman Walker has issued calls for the Seventh quarterly meeting of the Presidents of the Interstate Commerce Railway Association, Oct. 14, and the 19th regular meeting of the Board of Managers, Oct. 15. In connection with the call he has issued a circular letter to the presidents, in which he discusses the possibilities of settling existing traffic problems. He declares that the roads should discard independent action in initiating competitive rates, should take away from their traffic departments the authority to make competitive rates, and should put the whole subject of their establishment in the hands of a central agency, responsible directly to the presidents and directors of the associated lines. In addition, he recommends systematic division of traffic. The roads should place their entire joint traffic, to and from their eastern connections, in charge of a common agency, either a single individual or a joint stock corporation.

Round trip rates to the Chicago and St. Louis expositions from Colorado points have been abolished from all points west of the Missouri River and confined to points within the 300-mile limit. This is done to prevent scalping of the return portions, and prevent a demoralization of rates.

A meeting of the uniform bill of lading committee, representing the Trunk lines and Central Traffic Associations and the lake lines, was held here to-day.

The Chicago & Alton announces its intention to cut the rate on hard coal from Chicago to Kansas City from $3.20 to $1.50, in retaliation for alleged cuts by other lines.

The passenger department of the Central Traffic Association held a meeting yesterday, at which Mr. F C. Donald was elected vice-chairman to take charge of the passenger department, which office has been vacant since the resignation of Mr. Daniels.

John N. Faithorn, Chairman of the Western and Northwestern divisions of the Western Freight Association, was to-day elected Chairman of the new Southwestern Railway & Steamship Association, and has accepted. His headquarters will be in St. Louis. Mr. Faithorn is in every way a competent man, and his resignation will be a great loss to the Western Freight Association.

Traffic Notes.

The roads between St. Louis and Cincinnati, on Monday of this week, had reduced the round trip fare between these cities to $3, one road following another with successive reductions. The Pennsylvania, at last accounts, had reduced the Cincinnati-St. Louis rate to $6, but had not otherwise met the cuts.

Texas Rates.

The arbitrators on relative rates between St. Louis, New Orleans and Galveston to Texas common points have rendered their decision. The arbitrators were Messrs. Goddard, Finley and Hannaford (Northern Pacific). They decided that the old differentials, as between St. Louis and New Orleans, should be maintained, and that Galveston should have a differential of 35 cents, first class, and corresponding differentials for other classes. The decision is final, and settles the fight which some time ago reduced Texas rates more than 50 per cent.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Oct. 4, amounted to 71,823 tons, against 72,584 tons during the preceding week, a decrease of 761 tons, and against 59,246 tons during the corresponding week of 1889, an increase of 12,577 tons. The proportions carried by each road were:

	W'k to Oct. 4.		W'k to Sept. 27.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	7,690	10.7	8,152	11.0
Wabash	3,097	4.3	2,938	4.1
Lake Shore & Michigan South.	12,432	17.3	11,080	15.3
Pitts., Ft. Wayne & Chicago	7,921	11.0	8,371	11.6
Chicago, St. Louis & Pitts	11,619	16.2	10,571	14.6
Baltimore & Ohio	3,712	5.2	4,721	6.5
Chicago & Grand Trunk	9,039	12.6	7,986	11.0
New York, Chic. & St. Louis	8,663	12.1	7,700	10.6
Chicago & Atlantic	7,650	10.6	11,055	15.3
Total	71,823	100 0	72,584	100.0

Of the above shipments 1,929 tons were flour, 27,167 tons grain, 2,409 tons millstuffs, 6,275 tons cured meats, 2,323 tons lard, 9,266 tons dressed beef, 1,396 tons butter, 1,587 tons hides, 231 tons wool, and 8,650 tons lumber. The three Vanderbilt lines carried 40.1 per cent., while the two Pennsylvania lines carried 27.2 per cent. of all the business.

During the week the lake lines carried 79,414 tons, against 65,658 tons during the preceding week. Of the shipments 7,376 tons were flour and 64,124 tons grain.